

4.0 EFFECTS OF CALFED ACTIONS AND CONSERVATION MEASURES

4.1 IMPACT ANALYSIS APPROACH AND METHODS

The MSCS chapter analyzes the ways that CALFED could benefit or adversely affect NCCP communities and evaluated species within the MSCS Focus Area (see Figure 1-1). It does not evaluate potential indirect impacts of CALFED in other SWP and CVP service areas (see Section 4.5). However, the MSCS does all of the following:

- assesses proposed CALFED actions to identify the beneficial and adverse impacts they would have on NCCP habitats and associated evaluated species, including FESA designated critical habitats;
- develops appropriate conservation measures that would avoid, minimize, and compensate for potential adverse impacts;
- develops conservation measures to enhance evaluated species' habitats and populations based on beneficial CALFED actions;
- reassesses proposed CALFED actions in combination with the conservation measures to identify the beneficial and adverse impacts of implementing the actions and conservation measures together; and
- summarizes the results of the analysis.

The process used to analyze the effects of proposed CALFED actions included:

- identifying the proposed actions to be analyzed;
- combining actions that had similar purposes into programmatic groupings called "summary outcomes";
- identifying the NCCP habitats with which each evaluated species is associated;
- determining which evaluated species and FESA designated critical habitats could be affected by CALFED actions;
- identifying the types of activities necessary to implement proposed CALFED actions that could affect an NCCP community or evaluated species;

- determining the extent and distribution of each NCCP habitat within the Focus Area, using available databases;
- using information from existing reports and expert opinion to develop conservation measures that would avoid, minimize, and compensate for potential adverse impacts on NCCP communities and evaluated species and achieve species prescriptions;
- evaluating the overall effect that CALFED actions and MSCS conservation measures would have on NCCP communities and evaluated species; and
- summarizing the effect that summary outcomes and conservation measures would have on each NCCP community and evaluated species in the Focus Area.

4.1.1 CALFED ACTIONS EVALUATED IN THE MULTI-SPECIES CONSERVATION STRATEGY

The MSCS analyzes actions identified in the revised draft of CALFED plans issued in February 1999. Actions identified in the February 1999 draft and evaluated in the MSCS have not changed substantially. CALFED actions were reviewed to determine which of them may affect NCCP communities and evaluated species. Proposed CALFED actions with little or no potential to affect NCCP communities or evaluated species are:

- feasibility studies or other types of “paper” (nonfield) studies;
- resource management planning efforts (such as the development of a watershed management plan); and
- monitoring programs, such as for water quality, that would not result in take of evaluated species.

Attachment B, “Proposed CALFED Actions Evaluated in the Multi-Species Conservation Strategy”, lists the actions that the MSCS evaluates for each CALFED program element and region.

The MSCS is a programmatic document. Therefore, it analyzes summary programmatic action outcomes (“summary outcomes”) to determine the potential effects of CALFED actions. Summary outcomes describe the overall anticipated effect of implementing a group of proposed CALFED actions that would have similar ecological effects. For example, all of the following types of proposed ERP actions would contribute to the summary outcome “Restoration of 30,200–45,800 acres of tidal fresh emergent wetland”:

- restoring tidal freshwater emergent wetland,
- restoring tidal sloughs,
- restoring midchannel islands, and
- reducing the potential for boat-wake-induced erosion along tidal channels.

If a proposed action would have more than one ecological effect, and the effects are represented by different summary outcomes, that action may be included in more than one summary outcome. For example, actions to set back levees are included in summary outcomes that restore riparian habitat and restore sediment supply to river channels. Table 4-1 lists summary outcomes for each CALFED program element by region. Attachment B lists the CALFED actions included in each summary outcome.

4.1.2 DETERMINING THE LIKELIHOOD THAT CALFED ACTIONS WILL AFFECT EVALUATED SPECIES

A preliminary analysis of CALFED program elements was conducted to determine whether the proposed actions included in each element could have any adverse or beneficial effect on each evaluated species (Table 2-2). The potential indirect effects of CALFED actions in other SWP and CVP service areas were not analyzed. CALFED actions were considered likely to affect an evaluated species adversely or beneficially if individuals or populations of a species could be present in the area where actions could be implemented and

- implementing one or more actions may affect or could result in take of the species or
- implementing the actions would increase or decrease the extent or quality of habitat potentially occupied by the species.

Species considered unlikely to be affected by CALFED actions were species:

- that are highly mobile and for which habitat is not limiting, and that probably will not be sensitive to disturbance or
- that occur only in locations that CALFED likely would not affect.

The preliminary determinations of the potential species effects of proposed CALFED actions presented in Table 2-2 are intended to explain why each evaluated species was initially selected for further evaluation. For the MSCS's ultimate conclusions regarding effects on evaluated species, refer to Section 4.4 (Tables 4-10, 4-11, and 4-12).

4.1.3 EVALUATED SPECIES ASSOCIATED WITH NCCP HABITATS

In this programmatic analysis, a species is considered to be associated only with the NCCP habitats in which it regularly occurs and that are essential to maintaining its population. Therefore, NCCP habitats that a species uses only under limited or special circumstances were not considered to be a habitat type with which the species is associated. (For example, giant garter snakes depend on wetland habitats, but will use grassland habitat immediately adjacent to wetlands for hibernation and as refuge during floods.) These limited or special habitat requirements would be considered when assessing the impacts that proposed CALFED projects could have on evaluated species. Accounts prepared for each evaluated species describe each species' limited or special habitat requirements (see the MSCS technical report "Species Accounts for Multi-Species Conservation Strategy Evaluated Species"). Attachment C, "Evaluated Species Associated with NCCP Habitats", lists the NCCP habitats with which species are associated.

4.1.4 IMPACT ANALYSIS

The MSCS provides a programmatic analysis of potential beneficial and adverse effects, both direct and indirect, of proposed CALFED actions as embodied in the summary outcomes and with implementation of conservation measures (see Section 4.2) for each NCCP community. The analysis identifies the potential effects of implementing all actions associated with each summary outcome (Table 4-1). Implementing a particular action may only have some of the potential effects identified for a summary outcome.

The MSCS directly assesses the impacts that each summary outcome could have on NCCP communities in each CALFED region. The document indirectly assesses impacts on evaluated species other than fish, assuming that impacts on a habitat also affect the species that depend on the habitat. (Actions that increase or improve a species' habitat would be considered beneficial; those that decrease or degrade the habitat would be considered to have an adverse impact.) The analysis also assumes that summary outcomes (listed in Table 4-1) will be achieved when:

- proposed CALFED actions are implemented; or
- actions are modified based on monitoring and the adaptive management process.

4.1.4.1 HOW IMPACTS OCCUR

To determine the potential impacts of CALFED actions on NCCP communities and evaluated species, the MSCS team analyzed the types of activities that contribute to the summary outcomes, and therefore could have a direct or indirect adverse effect on an NCCP community or an evaluated species. These activities, called impact mechanisms, are presented in Table 4-2.

Many CALFED actions, such as those proposed under the ERP and Water Quality Program, are designed specifically to benefit evaluated species. However, impact mechanisms associated with actions that were developed to benefit evaluated species and NCCP communities in the long term may also cause adverse effects. For many of these actions, the potential adverse effects would be temporary. For example, restoring tidal shallow-water habitat to benefit Delta-dependent fish species could cause construction-related disturbances. These disturbances could cause species to avoid suitable habitat areas, or water quality could decline temporarily because equipment would operate in and adjacent to tidal aquatic habitat areas. Overall, however, the benefits to fish species of restoring tidal shallow-water habitat are expected to exceed the temporary adverse effects occurring during tidal restoration.

4.1.4.2 EVALUATION OF NCCP COMMUNITIES AND EVALUATED SPECIES

The following individuals contributed to the analysis of effects on NCCP communities and evaluated species:

- USFWS, NMFS, and DFG, and consulting biologists familiar with:
 - the NCCP habitats in the Focus Area;
 - the distribution, ecology, habitat requirements, and status of evaluated species; and
 - proposed CALFED actions;
- CALFED staff;
- staff from various other federal and State agencies and nongovernmental organizations; and
- independent species specialists.

When the actions that comprise the summary outcomes were not specific, a general statement of likely effects was made to explain potential effects on an NCCP community and associated species. (For example, if the location or magnitude of the action is not stated specifically, the MSCS may simply state that the habitat area could increase or decrease.)

4.1.4.3 EXTENT OF EXISTING NCCP HABITATS

CALFED used two regional habitat databases to estimate the existing extent of NCCP habitats within the Focus Area: the California Central Valley Wetlands and Riparian GIS (Wetlands GIS) and the California Gap Analysis landcover GIS database (Gap GIS). Each database was created for a different purpose and has its advantages and disadvantages.

The advantages of the Wetlands GIS are that it was created to represent riparian and wetland habitat types (including agricultural wetland types), which are of great importance to CALFED, and

that data are based on imagery acquired relatively recently (1993). The disadvantages of this GIS for use in the MSCS are that it does not distinguish upland habitats such as woodlands and shrub types, and that it does not map habitats for portions of the Focus Area above the valley floor (e.g., an elevation of roughly 300 feet).

The advantages of the Gap GIS are that the database covers the entire Focus Area and that it distinguishes between upland types. The disadvantages of this GIS for use in the MSCS are that it underrepresents wetland and riparian features that are very important to CALFED—narrow strips of these habitat types, in particular—and that the data are based on somewhat older imagery (1990). The Gap GIS uses a 40-hectare (ha) (99-acre) minimum mapping unit for wetlands, and a 100-ha (247-acre) minimum mapping unit for upland types.

Table 4-3 presents the extent of the NCCP habitats in ERP ecological management zones and units for each CALFED region (Figure 1-1) according to the Wetlands GIS database.

Table 4-4 presents the extent of the NCCP habitats in ERP ecological management zones and units for each CALFED region (Figure 1-1) according to the Gap GIS landcover database. The Gap GIS database's estimates for wetland and riparian acreage tend to be substantially lower than those of the Wetland GIS database.

4.2 CONSERVATION MEASURES

The MSCS contains two types of conservation measures for achieving the NCCP community and evaluated species prescriptions:

- measures to avoid, minimize, and compensate for CALFED's adverse effects on NCCP communities and evaluated species; and
- measures to enhance NCCP communities and evaluated species that are not directly linked to CALFED's adverse effects.

The first type of measures is designed to offset CALFED's adverse effects and will be undertaken by entities implementing CALFED actions. The second type of conservation measures generally represent refinements to portions of the ERP, Water Quality, Levee System Integrity, and CMARP elements of CALFED that will be beneficial to NCCP communities and evaluated species. These enhancement measures will be undertaken by many different entities, including CALFED agencies. Progress on implementing CALFED actions that adversely affect NCCP communities and evaluated species (i.e., facilities construction) may be linked to progress on implementing conservation measures to enhance the condition of these species and habitats (i.e., habitat restoration).

The discussion below describes both types of conservation measures for NCCP communities and for evaluated species. The precise conservation measures that will apply to avoid, minimize,

and compensate for an action's adverse effects will depend on the location and timing of the action, as well as the current status, distribution, and needs of the affected species and habitats. To the extent practicable, however, the priority for implementing these types of conservation measures is to first implement conservation measures to avoid adverse effects, then to implement measures to minimize adverse effects, and then to implement measures to compensate for adverse effects. The appropriate conservation measures will be incorporated into an ASIP for the CALFED action.

ERP actions to restore or enhance habitats that are implemented concurrently and in proximity to one another will be considered together for purposes of assessing their impacts on species and habitats and imposing compensatory measures. If the restoration and enhancement actions culminate in an increase or improvement in a particular NCCP community, compensatory measures may not be required even if there is a temporary or limited adverse modification of the community or habitat type. Ultimately, the need for compensatory conservation measures for CALFED restoration and enhancement actions will depend on the type, location, timing, and success of the related actions.

The MSCS conservation measures do not comprise all actions that will be credited toward, or required for, compliance with FESA, CESA, and NCCPA. USFWS, NMFS, and DFG will consider all proposed CALFED actions that would benefit or harm the MSCS's NCCP communities and evaluated species for purposes of determining whether CALFED complies with FESA, CESA, and NCCPA. CALFED actions, including ERP actions, that are not emphasized or refined in the MSCS may nonetheless be important for FESA, CESA, and NCCPA compliance.

4.2.1 CONSERVATION MEASURES FOR NCCP COMMUNITIES

4.2.1.1 CONSERVATION MEASURES TO AVOID, MINIMIZE, AND COMPENSATE

Conservation measures for NCCP communities include measures to avoid, minimize, and compensate for the adverse effects of CALFED actions. Tables summarizing these conservation measures for each NCCP community are presented in Attachment D, "Summary of Potential Beneficial and Adverse CALFED Effects and Conservation Measures". These tables present all of the conservation measures that may be required if all proposed CALFED actions embodied in the summary outcomes (Table 4-1) are implemented. More detailed descriptions of conservation measures for each NCCP community by CALFED region and summary outcome are presented in the MSCS technical report "Evaluation Tables and Multi-Species Conservation Strategy Conservation Measures for Natural Community Conservation Plan Communities".

Conservation measures for NCCP communities are primarily directed at conserving the quality and quantity of natural habitats, with the exception of those developed for upland cropland and seasonally flooded agriculture. Where CALFED actions would result in the permanent loss of natural NCCP habitats, restoration, enhancement, or protection of in-kind habitat would typically be required to compensate for the loss. Conservation measures for upland cropland and seasonally flooded agricultural habitats are not intended to conserve agricultural land uses. Rather, such

measures are directed at avoiding impacts on agricultural lands that provide high wildlife habitat values or replacing the wildlife habitat values the agricultural lands provide (e.g., the abundance or availability of forage for species that use agricultural lands).

Conservation measures developed for each NCCP community provide a menu of options to avoid, minimize, and compensate for CALFED impacts on that habitat or fish group. Some conservation measures presented in Attachment D may be more or less appropriate than others for addressing a specific type or level of CALFED impact on an NCCP community. Where CALFED actions result in the loss of habitat, the entity implementing the action must incorporate an adequate array of compensatory conservation measures into the ASIP for the action(s) and clearly identify the compensatory habitat.

4.2.1.2 CONSERVATION MEASURES TO ENHANCE

The MSCS incorporates conservation measures to enhance the condition of those NCCP communities with which “R” and “r” species are associated. As discussed below, some of the proposed actions associated with the elements of CALFED that are beneficial to NCCP communities and evaluated species (i.e., ERP, Water Quality, Levee System Integrity, and CMARP) were refined to further enhance their benefits to these evaluated species. These refinements, or enhancement conservation measures, also enhance the condition of the NCCP communities with which each of the “R” and “r” evaluated species are associated.

4.2.2 CONSERVATION MEASURES FOR EVALUATED SPECIES

4.2.2.1 CONSERVATION MEASURES TO AVOID, MINIMIZE, AND COMPENSATE

Conservation measures that avoid, minimize, and compensate for direct and indirect impacts on evaluated species apply to all evaluated species, regardless of the species goal (i.e., “m”, “r”, or “R”). These conservation measures are listed for each evaluated species in Attachment E, “Multi-Species Conservation Strategy Prescriptions and Conservation Measures for Evaluated Species”. For species that are extremely rare, a conservation measure is included that requires CALFED to avoid implementation of actions that would result in direct mortality of individuals. The MSCS applies this conservation measure to species listed in Table 4-5, which includes species whose populations are so rare or localized that loss of individuals of these species could substantially diminish species viability. Conservation measures to avoid, minimize, and compensate for impacts on NCCP communities also serve to compensate for impacts on evaluated species that are associated with affected NCCP communities. (See Attachments D-1 through D-20.)

These conservation measures represent a menu of options to avoid, minimize, and compensate for CALFED impacts on evaluated species. Some of the conservation measures presented in Attachments D and E may be more or less appropriate than others for addressing a

specific type or level of impact on an evaluated species. The appropriate conservation measures will be incorporated into an ASIP for the CALFED action or group of actions.

4.2.2.2 CONSERVATION MEASURES TO ENHANCE

The conservation measures to enhance NCCP communities and evaluated species are expected to achieve the prescriptions when implemented in conjunction with CALFED actions and the conservation measures to avoid, minimize, and compensate for CALFED impacts. These enhancement conservation measures represent the range of actions that may be required to ensure that prescriptions (i.e., species habitat or population targets that, if met, achieve species goals) for species with a “R” or “r” goal are achieved. In most instances, the need to implement a particular enhancement conservation measure for achieving “R” and “r” species goals will depend on how these species respond as ERP and other CALFED actions are implemented. For example, if implementation of ERP actions to restore and enhance saline emergent wetlands results in achieving the prescription for the Suisun song sparrow, additional MSCS enhancement conservation measures would not be necessary to achieve the species’ “R” goal.

4.2.2.3 CONSERVATION MEASURES FOR SPECIES DESIGNATED “R” AND “r”

Categories of conservation measures for species designated “R” or “r” are described below; Attachment E lists specific measures. These conservation measures compensate for adverse effects and enhance species recovery. The applicability of each type of conservation measure to a particular species depends primarily on the species’ current status and distribution, its ecological requirements, and the types of actions necessary to achieve its goal.

In general, conservation measures to avoid, minimize, and compensate for CALFED impacts require CALFED to:

- survey suitable habitat to determine the presence and distribution of species before it takes actions that could result in the loss or degradation of occupied habitat;
- manage lands that CALFED has purchased or acquired under conservation easements in a manner that maintains or increases the population of evaluated species occupying these lands, consistent with CALFED objectives;
- avoid actions, including construction, operation, land management, and incidental use, that could disturb evaluated species during sensitive periods (such as nesting);
- operate structures that control Delta flow patterns in a manner that avoids or reduces adverse effects on evaluated species, consistent with CALFED objectives;
- comply with applicable measures identified in USFWS and NMFS biological opinions previously issued for evaluated species; and

- maintain specific flows through the Delta and in Bay-Delta tributaries during certain important periods to improve habitat conditions for evaluated fish species, consistent with CALFED objectives.

In general, conservation measures developed to enhance NCCP communities and evaluated species require CALFED to:

- coordinate its actions and enhancement conservation measures with other federal and State programs (e.g., the SB1086 program, the USACE's Sacramento and San Joaquin Basin Comprehensive Study, CVPIA, the San Francisco Bay Ecosystem Goals Project, and USFWS and NMFS species recovery plans) that could affect management of species habitat to avoid potential conflicts and achieve multiple objectives;
- prioritize the ERP's habitat protection, enhancement, and restoration actions to best reach species prescriptions;
- enhance habitat or design restoration programs as necessary to achieve species prescriptions;
- act to protect and increase species populations (for example, by controlling predators or invasive non-native plants);
- remove or modify barriers to fish movement to improve access of evaluated fish species to important habitat areas, consistent with CALFED objectives;
- reduce or eliminate fish entrainment through existing unscreened or poorly screened water diversions;
- take appropriate action to improve water quality to benefit evaluated aquatic species; and
- monitor implementation and effectiveness of species recovery actions to determine whether they are achieving species prescriptions and, based on monitoring results, whether CALFED should modify its conservation measures through the adaptive management process to ensure species prescriptions are achieved.

4.2.2.4 CONSERVATION MEASURES FOR SPECIES DESIGNATED "m"

Categories of conservation measures for species designated "m" are described below; Attachment E lists specific measures. These conservation measures address avoidance, minimization, and compensation for adverse effects. The applicability of each type of conservation measure to a particular species depends primarily on the species' current status and distribution, its ecological requirements, and the types of actions necessary to achieve the "m" goal.

In general, conservation measures for species with an "m" goal require CALFED to:

- coordinate its actions with existing recovery plans to avoid potential conflicts;
- survey suitable habitat areas within the part of the species range that CALFED actions could affect, and determine habitat presence, distribution and importance, before it takes actions that could destroy or degrade the habitat;
- avoid actions that could cause the substantial loss or degradation of suitable habitat in areas that support core populations essential to maintaining the viability and distribution of the species;
- do either of the following, depending on the relative importance of habitat areas occupied by evaluated species:
 - acquire, protect, and manage existing occupied habitat; or
 - enhance or restore sufficient suitable habitat to replace the occupied habitat affected by CALFED actions;
- manage lands that CALFED has purchased or acquired under conservation easements in a manner that maintains or increases the population of evaluated species occupying these lands, consistent with CALFED objectives;
- prioritize the acquisition of lands or conservation easements toward lands that support important populations of evaluated species or are important habitat for evaluated species, consistent with ERP objectives;
- restore natural habitats adjacent to occupied habitats to create a buffer area that protects evaluated species from adverse affects of future land use changes, and to provide suitable habitat for natural population expansion, consistent with ERP objectives;
- comply with standardized USFWS, NMFS, and DFG species mitigation/compensation guidelines when implementing CALFED actions within occupied habitat for which guidelines have been developed;
- capture individuals, as appropriate, from occupied habitat that CALFED actions would adversely affect, and relocate them to nearby suitable existing, restored, or enhanced habitat;
- collect seed or other propagules, as appropriate, from evaluated plant species that CALFED actions would adversely affect, and use the collected material to inoculate unoccupied suitable habitat;

- analyze actions that could release large quantities of toxic materials from the soil to determine the amount of contaminants they could release and, if the contaminant loadings could be harmful, modify proposed actions to reduce such loadings, to the extent that doing so is consistent with achieving CALFED objectives;
- avoid construction, recreation, or other types of activities associated with implementing CALFED actions, operating facilities, or managing lands that could disturb evaluated species during sensitive periods (such as nesting);
- avoid or minimize implementing actions that could result in harm or mortality to individuals or adversely affect the viability of evaluated species' populations;
- monitor CALFED-managed sites that are occupied by evaluated species, as appropriate, especially after management activities, and modify management to maintain or increase current population levels using the adaptive management process; and
- obtain information about evaluated species' ecological requirements to ensure that species will be adequately conserved.

4.2.2.5 CONSERVATION MEASURE STUDIES AND SURVEYS

To ensure that conservation measures to avoid, minimize, and compensate, and conservation measures to enhance are effective in achieving prescriptions for NCCP communities and evaluated species, CALFED will also conduct species-specific research as part of CMARP and/or the ERP (Table 4-6). CALFED must survey and conduct research on species that have not been studied well to better understand these species' ecological requirements, restoration needs, abundance, and distribution; to determine the effects of CALFED actions; and to design adaptive management programs for these species. In addition to undertaking the study and survey measures described in Table 4-6, the CMARP also lists numerous studies, primarily for fish, that CALFED would conduct to obtain greater understanding of species recovery requirements.

Not all research listed in the MSCS will be necessary to restore species. For some species, studies proposed in the MSCS are essential for CALFED to develop the restoration actions it needs to meet species prescriptions. For other species, ERP restoration actions would provide anticipated benefits, and species-specific studies would be necessary only if restoration actions did not improve the species' status and distribution as expected. Chapter 6, "Compliance with the Federal and California Endangered Species Acts and Natural Community Conservation Planning Act", discusses how CALFED would use ASIPs to implement conservation measures, including those listed in this section.

The MSCS includes two categories of conservation measure studies and surveys, "essential studies and surveys" and "conditional studies and surveys". Essential studies and surveys must be conducted to provide the information necessary for CALFED to understand certain evaluated species

well enough to ensure that the prescriptions for these species are achieved. Conditional studies and surveys provide additional information about species and are conducted only when implementing conservation measures has not produced expected benefits.

Some research is called essential for meeting species prescriptions, but this does not mean that it would be implemented during Stage 1 of CALFED. Priorities for conducting research on species will depend largely on species and ecosystem restoration needs relative to CALFED as a whole. For some species, research may be conducted during later stages of CALFED.

4.3 SUMMARY OF EFFECTS ON NCCP COMMUNITIES

Attachment D lists the potential impacts of implementing all proposed CALFED actions on NCCP communities. Table 4-7 summarizes the expected long-term effect of implementing CALFED actions and the MSCS conservation measures on NCCP communities. The findings in Table 4-7 assume that:

- all of CALFED is implemented, including MSCS conservation measures; and
- CALFED's WMS is designed and implemented in a manner that promotes recovery of fish species.

If CALFED is only partially implemented or the WMS is unsuccessful, there will be adverse effects on NCCP communities; effects on the NCCP fish groups and some NCCP habitats will differ from those presented in Table 4-7. The WMS is an important feature of CALFED that can meet fish protection, water quality, and water supply goals simultaneously. Failure to develop and implement an ecologically effective WMS would likely lead to substantial changes in the summary effects for fish groups presented here.

The MSCS does not assess the precise extent and location of NCCP habitats that could be affected by implementation of CALFED actions. Specific details about CALFED actions that could result in the loss of existing habitat, including where actions would be implemented, are not known. ASIPs will assess impacts on existing habitats when CALFED or other entities propose to implement specific actions.

Generally, implementing CALFED actions would convert existing natural (nonagricultural) habitat types to other natural habitat types. For example, setting back or breaching Delta levees could convert nontidal freshwater permanent emergent wetlands on Delta islands to tidal freshwater emergent wetlands. There could also be a loss of natural habitat during construction of conveyance facilities, roads, or other infrastructure; however, implementing CALFED actions and conservation measures that compensate for habitat loss would increase the extent or quality of most natural NCCP habitats. Some overall loss of grassland and upland scrub habitats could result from conversion of these habitat types to other natural habitats or to other uses. For example, construction of proposed

new surface water storage facilities could result in overall loss of grassland, upland scrub, and other upland habitats.

Implementing proposed CALFED actions would also convert a substantial amount of agricultural lands (primarily in the Delta Region) to natural habitat or to other uses, such as conveyance and storage facilities. Where agricultural lands that support evaluated species are adversely affected by CALFED, habitat functions on these lands would be replaced or increased, however, if:

- sufficient natural NCCP habitats suitable for the affected evaluated species were restored and enhanced,
- cropping patterns or agricultural land use practices were changed on other agricultural lands to sufficiently enhance habitat values for the affected evaluated species, or
- conservation measures were implemented to compensate for loss of affected evaluated species' habitat values.

The conservation measures in the MSCS will not cause a loss of agricultural lands beyond what is described in the Programmatic EIS/EIR.

4.3.1 ESTIMATED CHANGE IN NCCP HABITATS WITH IMPLEMENTATION OF THE ECOSYSTEM RESTORATION PROGRAM IN THE DELTA REGION

GIS coverage of the area of existing habitats is complete for the Delta Region. It is therefore possible to analyze how implementing the ERP would change the extent of NCCP habitats. For several NCCP habitats, the ERP targets a specific acreage for restoration, although the amount of NCCP habitat that will be restored cannot be estimated for many of the actions. For example, restoring the ERP's Delta slough habitat type could mean restoring varying amounts of tidal perennial aquatic, valley/foothill riparian, tidal freshwater emergent, and saline emergent NCCP habitat (Table 4-8).

Table 4-9 compares the existing extent of NCCP habitats to the future extent of these NCCP habitats in the Delta Region, assuming full implementation of ERP habitat restoration actions for these habitats:

- aquatic (includes tidal perennial aquatic and lacustrine NCCP habitats),
- seasonal wetland (includes managed and natural seasonal wetland NCCP habitats),

- freshwater permanent emergent wetland (includes tidal freshwater emergent and nontidal freshwater permanent emergent NCCP habitats), and
- valley/foothill riparian habitat.

Implementing ERP habitat restoration actions could increase the total area of these NCCP habitats by 222%–243% in the Delta Region.

4.4 SUMMARY OF EFFECTS ON EVALUATED SPECIES

This section presents a programmatic analysis and summary of the short-term and long-term effects on evaluated species that are expected to result from implementing CALFED actions. Attachment B lists the CALFED actions addressed in the analysis. Attachments D and E list the conservation measures for NCCP communities and evaluated species that will be implemented in conjunction with the CALFED actions addressed in Attachment B.

In this section, the analysis of effects on evaluated species is presented in three ways:

- Table 4-10 identifies which evaluated species may be adversely affected by one or more proposed CALFED actions.
- In Table 4-11, the expected adverse and beneficial effects of implementing CALFED actions and MSCS conservation measures are aggregated to identify CALFED’s ultimate long-term effects on each evaluated species. Table 4-11 is intended to show whether each evaluated species is likely to benefit from the implementation of CALFED actions and MSCS conservation measures when their adverse effects and beneficial effects are considered together.
- In Table 4-12, adverse effects and beneficial effects are aggregated to show in greater detail what are expected to be the ultimate effects on evaluated species with an “R” and “r” goal if CALFED actions and MSCS conservation measures are implemented as proposed.

As illustrated by Table 4-10 and Table 4-11, many evaluated species are likely to experience at least short-term adverse effects, but these species are ultimately expected to benefit from implementation of CALFED actions with MSCS conservation measures. In addition, as shown in Table 4-12, “R” and “r” species are expected to benefit substantially from implementation of CALFED actions with MSCS conservation measures.

The conclusions indicated by each column in Table 4-10 reflect certain informational requirements in Section 7 of FESA. Species listed in Table 4-10 in the “No Effect” column will not be beneficially or adversely affected by proposed CALFED actions. Species listed in the “Not Likely to Adversely Affect” column could be affected by proposed CALFED actions, but the potential

effects of CALFED actions are expected to be discountable, insignificant, or completely beneficial. Lastly, species listed in the “Likely to Adversely Affect” column may be adversely affected as a direct or indirect result of CALFED actions or any interrelated or interdependent actions. Species shown in the “Likely to Adversely Affect” column include species that:

- will be adversely affected by implementation of CALFED actions;
- will benefit from implementation of CALFED actions, but could experience some small or short-term adverse effects as a result of certain actions; and
- are likely to be affected by CALFED actions, but the type and magnitude of the effects cannot be determined because of insufficiently detailed information about certain actions.

As shown in Table 4-10, implementation of CALFED actions will have both beneficial and adverse effects on evaluated species, including FESA-listed and proposed species.

Table 4-11 summarizes the long-term, aggregate effects on evaluated species expected from implementing proposed CALFED actions with MSCS conservation measures. Table 4-10 identifies evaluated species that are likely to be adversely affected by CALFED actions, but the MSCS prescribes conservation measures to avoid, minimize, and compensate for these adverse effects. In addition, implementation of the ERP and the enhancement conservation measures listed in Attachment E will benefit many of the evaluated species. Thus, Table 4-11 shows that none of the evaluated species identified in Table 4-10 as likely to be adversely affected will suffer long-term adverse effects, and that many will ultimately benefit from implementation of CALFED actions with MSCS conservation measures.

Table 4-12 presents a more detailed summary of the long-term, aggregate effects on species with “R” and “r” goals expected from implementing proposed CALFED actions with MSCS conservation measures. Implementation of CALFED actions and the MSCS conservation measures is expected to achieve substantial benefits for these species over the 30-year life of CALFED. CALFED actions, including the MSCS conservation measures, are expected to achieve the “R” and “r” goals.

Populations of species with the “m” goal are expected either to be maintained at their current levels or to derive benefits from implementation of CALFED actions and the MSCS conservation measures. Populations of some evaluated species with an “m” goal are expected to increase as a result of implementing certain ERP actions that will increase the extent or quality of their habitats (Table 4-11).

The conclusions presented in Tables 4-10, 4-11, and 4-12 assume that:

- all CALFED programs are implemented, including MSCS conservation measures; and
- the WMS is designed and implemented in a way that promotes recovery of evaluated fish species.

Partial CALFED implementation or an unsuccessful WMS will result in deviations from the summary effects presented in Table 4-12.

4.5 CALFED TREATMENT OF SERVICE AREA EFFECTS

FESA Section 7 implementing regulations require that biological opinions evaluate indirect effects of a federal agency action on listed species. Examples of indirect effects caused by water delivery include growth-inducing impacts or changes in cropping patterns. CALFED may affect the reliability and/or timing of water supplies, which may affect habitats of listed species in some CVP and SWP service areas. Section 7 regulations also require that interrelated and interdependent actions be evaluated. USFWS and NMFS cannot issue biological opinions without considering such actions.

The MSCS does not evaluate the potential indirect effects resulting from water supply reliability measures. This document is programmatic, and the preferred alternative related to water supply reliability will be determined largely in an incremental fashion through an adaptive management process; therefore, it has not been possible to evaluate potential service area effects on species and habitats. Project-level or site-specific impacts may not be known until Phase III of CALFED (implementation). MSCS evaluated species could be affected by changes in water supply reliability that result in land use changes. Other species that have not been evaluated by the MSCS could also be affected.

Several other water resource-related projects in the Central Valley have discussed service area impacts on listed species:

- Reclamation's interim water contract renewals for the CVP,
- Friant Division contract renewals,
- CVP operations and maintenance and CVPIA implementation,
- the Los Vaqueros Project, and
- Solano and Sacramento County contract renewals.

Most of these projects have addressed indirect effects by identifying a short-term strategy based on critical species needs for recovery and restoration, and a long-term strategy for dealing with impacts that cannot be predicted when the biological opinions are issued.

CALFED proposes a two-step process to address potential service area effects that are currently unknown. First, CALFED will determine the presence and scope of service area effects, if any. Then, to address the effects it has identified, CALFED will integrate proactive, conservation planning approaches with specific conservation measures. To do this, CALFED will develop the four conservation measures listed below during the remainder of Phase II and during Phase III.

To ensure that CALFED's proposed actions would not be likely to jeopardize the continued existence of listed species or to destroy or adversely modify designated critical habitat, CALFED

agencies would develop and implement a combination of the conservation measures described below, as appropriate for CALFED actions and their indirect effects. These measures include:

- preparing HCPs or conservation programs in the service areas covering the effects of land use changes (many HCPs that address land use changes already exist in specific locations in CALFED's Solution Area),
- evaluating each future water supply reliability program being implemented and including any measures to address indirect effects in the ASIPs,
- developing or contributing to conservation programs that would address the critical needs of species in CALFED service areas not already covered by conservation plans, and
- implementing the applicable conservation measures already in the MSCS to conserve species relative to service area effects.

4.5.1 HABITAT CONSERVATION PLANS

Individuals or entities in service areas that benefit from CALFED actions may complete HCPs that address changes in land use related to water delivery changes. According to Section 10(a)(1)(b) of FESA, an HCP serves as the foundation for an incidental take permit for projects that may affect listed species that do not have a federal nexus. Section 7 of FESA states that actions that do have a federal nexus could receive incidental take authorization contained in a biological opinion.

Water agencies in CALFED's service area could coordinate the development of an HCP with technical or financial assistance from CALFED. The service area agencies would have the right to determine the HCP's scope. The HCP must be consistent with CALFED's commitment to protect species that would be adversely affected by proposed actions and for which incidental take would likely occur. There would be no changes in service areas until the water agencies and CALFED completed the HCP or until CALFED contributed to an overall conservation program.

4.5.2 SERVICE AREA EFFECTS IN ACTION SPECIFIC IMPLEMENTATION PLANS

Specific indirect effects to listed species currently cannot be determined precisely because CALFED actions are programmatic. An evaluation of water delivery service areas would become part of the required evaluation process in the ASIPs for a water supply reliability action. In the ASIP, specific conservation measures would be developed to address any water delivery related effects to species and habitats. Chapter 6 describes the ASIPs in detail.

4.5.3 PROACTIVE DEVELOPMENT OF OR CONTRIBUTION TO OTHER PROGRAMS

Reclamation and USFWS developed the CVP Conservation Program to work with other programs to protect, restore, and enhance the habitat and related needs of special-status species in areas affected by the CVP. Implementation of this program is meant to facilitate the comprehensive FESA Section 7 consultation on CVP operations, including implementation of CVPIA. The objectives of the Conservation Program are to:

- address the needs of threatened and endangered species in an ecosystem-based manner,
- assist in the conservation of biological diversity, and
- improve existing conditions for threatened and endangered species and reduce conflicts with future projects.

The CVP Conservation Program implements the highest-priority recovery actions (“critical needs”) for listed species in areas that receive federal water. Through the Conservation Program, Reclamation, in coordination with USFWS, is implementing a critical needs program to protect special-status species and their habitats within CVP contract service areas.

As a conservation measure, CALFED could augment the CVP Conservation Program or similar conservation efforts to help meet species’ critical needs. CALFED agencies and/or their beneficiaries could provide additional resources such as funding, lands, and easements to address and protect the critical needs of special-status species affected by water deliveries. Actions by these agencies could include the long-term protection and management of habitat important to the recovery of listed species, and the implementation of the short-term and long-term critical needs.

4.5.4 IMPLEMENTATION OF CONSERVATION MEASURES INCLUDED IN THIS MULTI-SPECIES CONSERVATION STRATEGY

Many MSCS conservation measures address effects of CALFED actions on MSCS species and habitats in the service area. Implementation of these measures could be expanded to address not only the effects of CALFED actions as discussed in the MSCS, but also the adverse effects that could result in water delivery service areas.

Table 4-1. Summary Programmatic Action Outcomes

Multi-Species Conservation Strategy (MSCS) User Guide: This table identifies the summary programmatic action outcomes for each potential CALFED action. (A summary programmatic action outcome is the probable overall effect of implementing one or more CALFED actions proposed under each program that would have a similar ecological effect when implemented.) Each summary programmatic action outcome is coded; for example, the first summary programmatic action outcome in this table is coded "E1". Each code is used to reference the individual actions proposed under each program that is analyzed in the MSCS. The individual CALFED actions comprising each summary programmatic action outcome for each CALFED region are presented in MSCS Attachment B, "Proposed CALFED Actions Evaluated in the Multi-Species Conservation Strategy".

Summary Programmatic Action Outcomes		Applicable CALFED Region			
		Delta	Bay	Sacramento River	San Joaquin River
Ecosystem Restoration Program					
E1.	Provide for more natural river flows and Bay-Delta freshwater inflow peaks in fall, winter, and spring of all but critical years.	X	X	X	X
E2.	Improvement in the supply of sediment to rivers and streams necessary to provide spawning gravels and rehabilitation of related ecological processes (e.g., stream meander) and floodplain habitats (e.g., riparian habitats).			X	X
E3.	Maintenance of stream temperatures necessary to maintain anadromous fishes through management of reservoir releases or structural solutions. (This does not include the effect of restoration of riparian vegetation on maintaining stream temperatures.)			X	
E4.	Provide more natural Delta hydraulic conditions (internal flow and velocity patterns) by altering channel configurations (e.g., setback levees) and physical barriers to channel flow.	X			
E5a.	Restoration of up to 7,500 acres of tidal shallow-water habitat.	X			
E5b.	Restoration of at least 1,500 acres of tidal shallow-water habitat.		X		
E6.	Restoration and maintenance of riverine aquatic habitats.			X	X
E7.	Protection of 6,200 existing acres and restoration of 7,500–12,000 additional acres of tidal saline emergent wetlands.		X		

Table 4-1. Continued

Summary Programmatic Action Outcomes		Applicable CALFED Region			
		Delta	Bay	Sacramento River	San Joaquin River
Ecosystem Restoration Program (continued)					
E8.	Restoration of 30,200–45,800 acres of tidal fresh emergent wetlands.	X			
E9.	Maintenance of existing channel islands and associated habitats; restore restoration of 200–800 acres of channel islands and associated habitats.	X			
E10a.	Restoration of 115–260 miles (698–1,576 acres) of tidal sloughs.	X			
E10b.	Restoration of 35–70 miles (213–423 acres) of tidal sloughs.		X		
E11.	Restoration of up to 19,600 acres of nontidal freshwater emergent wetlands and associated open-water habitat.	X			
E12.	Restoration of up to 1,600 acres of nontidal deep open-water habitat adjacent to existing and restored wetlands.		X		
E13a.	Enhancement of up to 4,000 acres of existing seasonal wetlands and restoration and management of up to 28,000 acres of seasonal wetlands for wildlife.	X			
E13b.	Restoration of 1,000–1,500 acres of seasonal wetlands and enhancement and management of up to 58,000 acres of existing seasonal wetlands for wildlife.		X		
E13c.	Enhancement and management of up to 73,325 acres of existing seasonal wetlands for wildlife.			X	
E13d.	Protection and enhancement of up to 172,800 acres of seasonal wetlands in the San Joaquin River Ecological Management Zone, and protection and enhancement of existing seasonal wetlands elsewhere in the San Joaquin River Region.				X
E14.	Protection and enhancement of up to 100 acres of vernal pools and 500–1,000 acres of surrounding lands.		X		

Table 4-1. Continued

Summary Programmatic Action Outcomes	Applicable CALFED Region			
	Delta	Bay	Sacramento River	San Joaquin River
Ecosystem Restoration Program (continued)				
E15a. Restoration of 1,195–1,284 acres of riparian habitat along up to 85 miles of channels, restoration of riparian habitat in association with setback levees, protection of 500 acres of existing riparian forest, and reduction of current invasive riparian plants by 50%.	X			
E15b. Restoration of 200–300 acres of riparian habitat along up to 75 miles of channels and reduction of populations of invasive non-native riparian plants by 50%.		X		
E15c. Protection and enhancement of riparian habitat associated with enhancement of 17,000–25,000 acres of meander zones along the Sacramento River and its tributaries; protection, enhancement, and restoration of up to 3,635 acres of riparian habitat and shaded riverine aquatic (SRA) cover along other reaches of the Sacramento River and its tributaries; and reduction of populations of non-native invasive plants.			X	
E15d. Restoration of up to 5,932 acres of riparian and shaded riverine aquatic habitat; protection and enhancement of up to 1,000 acres of riparian habitat in meander zones along San Joaquin River tributaries; protection, enhancement, restoration of riparian habitat and SRA cover along up to 75 miles of channels in other reaches of the San Joaquin River and its tributaries; and reduction of populations of non-native invasive plants along the northern tributaries to of the San Joaquin River.				X
E16a. Restoration of 4,000–6,000 acres of perennial grassland.	X			
E16b. Restoration of up to 5,000 acres of perennial grassland.		X		
E16c. Restoration of perennial grassland associated with existing or restored wetlands in the American River basin.			X	
E17. Protection and enhancement of 50–100 acres of inland dune scrub.	X			

Table 4-1. Continued

Summary Programmatic Action Outcomes		Applicable CALFED Region			
		Delta	Bay	Sacramento River	San Joaquin River
Ecosystem Restoration Program (continued)					
E18a.	Cooperative management of 40,000–75,000 acres of agricultural lands to enhance habitat values for waterfowl and other associated species.	X			
E18b.	Cooperative management of up to 298,643 acres of agricultural lands to enhance habitat values for waterfowl and other associated species.			X	
E18c.	Cooperative management of up to 15,290 acres of agricultural lands to enhance habitat values for waterfowl and other associated species.				X
E19.	Restoration of flood-refuge habitat areas for wildlife along levees and other lands adjacent to existing and restored habitat areas.	X			
E20.	Reduction in the adverse effects of dredging on estuarine aquatic habitats.	X			
E21.	Reduction in the probability of introduction and establishment of non-native aquatic species into the Bay-Delta.	X	X		
E22.	Reduction in the adverse effects of diversions on fish.	X	X	X	X
E23.	Improvement in passage of anadromous fish to and from spawning areas and reduction in levels of fish straying as a result of reducing the effects of structural impediments to fish movement.			X	X
E24.	Reduction in levels of predation on juvenile anadromous fish.	X	X	X	X
E25.	Reduction in the adverse effects of harvest on fish and wildlife populations.	X	X	X	X
E26.	Improved management of fish hatcheries to better maintain the genetic integrity of wild stocks of anadromous fishes.			X	X
E27a.	Reduction in the concentrations and loadings of contaminants in the aquatic environment by 25%–50%.	X	X		

Table 4-1. Continued

Summary Programmatic Action Outcomes		Applicable CALFED Region			
		Delta	Bay	Sacramento River	San Joaquin River
Ecosystem Restoration Program (continued)					
E27b.	Reduction in the concentrations and loadings of contaminants in the aquatic environment.			X	X
E28.	Reduction in the adverse effects of boat wakes on shoreline habitats and wildlife in sensitive habitat areas.	X	X		
E29.	Enhancement of habitat conditions for the riparian brush rabbit in habitat areas at and near Caswell State Park on the Stanislaus River.	X			X
E30.	Enhancement of habitat conditions for the Suisun song sparrow in occupied habitat areas.		X		
Levee System Integrity Program					
L1.	Improvement and maintenance of Delta levees.	X			
L2.	Reduction in the risk to levee stability from subsidence.	X			
L3.	Improvement and maintenance of Suisun Marsh levees.		X		
Water Quality Program					
Q1.	Reduction of oxygen-depleting substances in the aquatic environment.	X		X	X
Q2.	Maintain pathogen loadings below maximum allowed levels and reduce levels of total organic carbon, bromide, and total dissolved solids to increase the availability of water for beneficial uses.	X	X	X	X
Q3.	Reduction of mercury loadings in water and sediment.			X	
Q4.	Reduction of pesticide loadings in the aquatic environment.	X	X	X	X
Q5.	Management of salinity levels in the aquatic environment to improve water quality.				X

Table 4-1. Continued

Summary Programmatic Action Outcomes		Applicable CALFED Region			
		Delta	Bay	Sacramento River	San Joaquin River
Water Quality Program (continued)					
Q6.	Reduction in selenium concentrations and loadings to the aquatic environment.				X
Q7.	Reduction of cadmium, copper, and zinc loadings to levels that do not adversely affect Bay-Delta species or beneficial uses of water.	X	X	X	X
Q8.	Reduction of sediment loadings to levels that do not adversely affect beneficial uses of surface water.		X		X
Water Use Efficiency Program					
W1.	Support implementation of water management techniques that increase the effectiveness of water use management and efficiency for agricultural uses.	X	X	X	X
W2.	Support implementation of measures that increase agricultural production per unit of water used, protect water quality, or increase environmental benefits while meeting agricultural needs.	X	X	X	X
W3.	Provide urban water agencies with planning and technical assistance, financing assistance, and assurances for development and implementation of water management plans and best management practices.	X	X	X	X
W4.	Support development and implementation of water recycling projects.	X	X	X	X
Water Transfer Program					
T1.	Implement a framework of actions, policies, and processes that will facilitate transfers and the further development of a statewide water transfer market.	X	X	X	X
Watershed Management Program					
M1.	Fund and implement watershed restoration, maintenance, conservation, and monitoring activities.	X	X	X	X

Table 4-1. Continued

Summary Programmatic Action Outcomes		Applicable CALFED Region			
		Delta	Bay	Sacramento River	San Joaquin River
Conveyance Facilities					
C1.	Construct and operate modifications to existing south Delta conveyance features.	X			
C2.	Construct and operate modifications to existing north Delta conveyance features.	X			
C3.	Construct and operate an isolated conveyance facility from the Sacramento River along the eastern side of the Delta to Clifton Court Forebay.	X			
Storage Facilities					
S1.	Construct and operate enlarged or new surface water storage facilities.	X		X	X
S2.	Construct and operate new groundwater storage facilities.			X	X
Conveyance and Storage Operations					
01.	Implement operating criteria needed to improve water management for beneficial uses.	X	X	X	X
02.	Implement a Water Management Strategy to provide operational flexibility to achieve environmental benefits.	X	X	X	X

Table 4-2. Impact Mechanisms Potentially Associated with Summary Outcomes

Multi-Species Conservation Strategy (MSCS) User Guide: This table describes the impact mechanisms potentially associated with implementing actions related to each summary outcome. (Impact mechanisms are the activities that could be associated with implementing CALFED actions that could result in an adverse effect on Natural Conservation Community Plan [NCCP] communities or evaluated species.) Summary outcome codes that correspond to summary outcomes specific to each CALFED Region are shown in parentheses; they correspond to the summary outcome codes and descriptions shown in Table 4-1 and MSCS Attachment B, "Proposed CALFED Actions Evaluated in the Multi-Species Conservation Strategy". The impact mechanisms described in this table were used to identify potential adverse effects on NCCP communities and evaluated species.

Summary Programmatic Action Outcome	Impact Mechanisms Associated with Program Implementation
Ecosystem Restoration Program	
Provide for more natural river flows and Bay-Delta freshwater inflow peaks in fall, winter, and spring of all but critical years (E1).	1. Changes in timing, stage, and velocity of flows that could be sufficient to alter habitat along channels.
Improvement in the supply of sediment to rivers and streams necessary to provide spawning gravels and rehabilitation of related ecological processes (e.g., stream meander) and floodplain habitats (e.g., riparian habitats) (E2).	1. Inchannel construction activity. 2. Demolition and construction activities associated with setting back levees. 3. Demolition activities associated with removal of bank protection or other structures.
Maintenance of stream temperatures necessary to maintain anadromous fishes through management of reservoir releases or structural solutions. (This does not include the effect of restoration of riparian vegetation on maintaining stream temperatures.) (E3)	1. Changes in timing, stage, and velocity of flows.
Provide more natural Delta hydraulic conditions (internal flow and velocity patterns) by altering channel configurations (e.g., setback levees) and physical barriers to channel flow (E4).	1. Changes in timing, stage, and velocity of flows. 2. Changes in patterns of flow in Delta channels. 3. In-channel construction activity. 4. Grading, excavation, and other construction activity associated with restoration of habitat. 5. Demolition and construction activities associated with setting back levees.
Restoration of tidal shallow-water habitat (E5a and E5b).	1. In-channel construction activity. 2. Placement of fill and other construction activity associated with restoration of habitat. 3. Demolition and construction activities associated with setting back or breaching levees and dikes. 4. Construction activities associated with modifying or constructing new levees. 5. Introduction of tidal exchange to existing agricultural and other nontidal habitats.
Restoration and maintenance of riverine aquatic habitats (E6).	1. In-channel construction activity. 2. Demolition and construction activities associated with setting back levees. 3. Demolition activities associated with removal of bank protection or other structures. 4. Collection and planting of riparian vegetation. 5. Excavation, grading, and other construction activities associated with restoration of channels and overflow channels. 6. Change in floodplain hydrologic patterns.

Summary Programmatic Action Outcome	Impact Mechanisms Associated with Program Implementation
Ecosystem Restoration Program (continued)	
Restoration of tidal emergent wetland habitats (E7 and E8).	<ol style="list-style-type: none"> 1. In-channel construction activity. 2. Demolition and construction activities associated with setting back or breaching levees and dikes. 3. Construction activities associated with modifying or constructing new levees. 4. Collection and planting of emergent vegetation. 5. Introduction of tidal exchange to existing agricultural and other nontidal habitats. 6. Chemical or mechanical control of non-native invasive plants.
Maintenance of existing and restoration of up to 200–800 acres of channel islands and associated habitats (E9).	<ol style="list-style-type: none"> 1. In-channel construction activity. 2. Placement of riprap or other structures to prevent or reduce erosion of islands. 3. Placement of fill material to create or enlarge channel islands.
Restoration of tidal sloughs (E10a and E10b).	<ol style="list-style-type: none"> 1. In-channel construction activity. 2. Demolition and construction activities associated with setting back or breaching levees and dikes. 3. Construction activities associated with modifying or constructing new levees. 4. Excavation, grading, and other construction activities associated with restoration of tidal sloughs. 5. Introduction of tidal exchange to existing agricultural and other nontidal habitats. 6. Chemical or mechanical control of non-native invasive plants.
Restoration of up to 19,600 acres of nontidal freshwater emergent wetland and associated open-water habitat (E11).	<ol style="list-style-type: none"> 1. Excavation, grading, and other construction activities associated with restoration of nontidal emergent wetlands. 2. Conversion of agricultural and natural habitats to emergent nontidal wetlands. 3. Chemical or mechanical control of non-native invasive plants.
Restoration of up to 1,600 acres of nontidal deep open-water habitat adjacent to existing and restored wetlands (E12).	<ol style="list-style-type: none"> 1. Excavation, grading, and other construction activities associated with restoration of lacustrine habitats. 2. Conversion of agricultural and natural habitats to lacustrine habitats.
Enhancement and restoration of seasonal wetlands for wildlife (E13a, E13b, E13c, and E13d).	<ol style="list-style-type: none"> 1. Excavation, grading, and other construction activities associated with restoration of seasonal wetlands and improvement to water conveyance and other management infrastructure. 2. Conversion of agricultural and natural habitats to seasonal wetlands. 3. Change in land use practices (e.g., modification of existing livestock grazing patterns). 4. Chemical or mechanical control of non-native invasive plants.

Summary Programmatic Action Outcome	Impact Mechanisms Associated with Program Implementation
Ecosystem Restoration Program (continued)	
Protection and enhancement of up to 100 acres of vernal pools and 500–1,000 acres of surrounding lands (E14).	1. Excavation, grading, and other construction activities associated with restoration of vernal pools and their watersheds.
Protection, enhancement, and restoration of riparian habitat along channels (E15a, E15b, E15c, and E15d).	<ol style="list-style-type: none"> 1. In-channel construction activity. 2. Demolition and construction activities associated with setting back or breaching levees and dikes. 3. Construction activities associated with modifying or constructing new levees. 4. Excavation, grading, and other construction activities associated with restoration of riparian habitats. 5. Conversion of agricultural and natural habitats to riparian habitat. 6. Change in land use practices (e.g., modification of existing livestock grazing patterns). 7. Chemical or mechanical control of non-native invasive plants.
Restoration of perennial grassland (E16a, E16c, and E16d).	<ol style="list-style-type: none"> 1. Chemical or mechanical control of non-native invasive plants. 2. Grading and other ground-disturbance activities associated with reestablishment of perennial grasses and associated vegetation.
Protection and enhancement of 50–100 acres of inland dune scrub (E17).	<ol style="list-style-type: none"> 1. Chemical or mechanical control of non-native invasive plants. 2. Placement of fill, grading, and other ground-disturbance activities associated with reestablishment of inland dunes. 3. Change in land use practices (e.g., modification of existing livestock grazing patterns).
Cooperative management of agricultural lands to enhance habitat values for waterfowl and other associated species (E18a, E18b, and E18c).	<ol style="list-style-type: none"> 1. Change in agricultural cropping patterns and practices. 2. Construction and other activities necessary to improve agricultural infrastructure.
Restoration of flood-refuge habitat areas for wildlife along levees and other lands adjacent to existing and restored habitat areas (E19).	<ol style="list-style-type: none"> 1. Chemical or mechanical control of non-native invasive plants. 2. Grading and other ground-disturbance activities associated with reestablishment of perennial grasses and associated vegetation.
Reduction in the adverse effects of dredging on estuarine aquatic habitats (E20).	None.
Reduction in the probability of introduction and establishment of non-native aquatic species into the Bay-Delta (E21).	None.
Reduction in the adverse effects of diversions on fish (E22).	1. Demolition and construction activities associated with removing existing and installing new screens, and consolidating or relocating diversions.

Summary Programmatic Action Outcome	Impact Mechanisms Associated with Program Implementation
Ecosystem Restoration Program (continued)	
Improvement in passage of anadromous fish to and from spawning areas and reduction in levels of fish straying as a result of reducing the effects of structural impediments to fish movement (E23).	1. Demolition and/or construction activities associated with removing barriers to fish passage, modifying existing structures to improve fish passage, and constructing new structures to improve fish passage around barriers.
Reduction in levels of predation on juvenile anadromous fish (E24).	1. Demolition and/or construction activities associated with removal or modification of in-channel structures to remove non-native predator habitat. 2. Fill or grading activities associated with eliminating the hydrologic connectivity of gravel pits on floodplains with active stream channels.
Reduction in the adverse effects of harvest on fish and wildlife populations (E25).	None.
Improved management of fish hatcheries to better maintain the genetic integrity of wild stocks of anadromous fishes (E26).	1. Construction and other activities associated with construction.
Reduction in the concentrations and loadings of contaminants in the aquatic environment (E27a and E27b).	1. In-channel disturbances associated with removing sources of contaminants. 2. Change in agricultural land use practices associated with reductions in use of pesticides.
Reduction in the adverse effects of boat wakes on shoreline habitats and wildlife in sensitive habitat areas (E28).	None.
Enhancement of habitat conditions for the riparian brush rabbit in habitat areas at and near Caswell State Park on the Stanislaus River (E29).	1. In-channel construction activity. 2. Demolition and construction activities associated with setting back or modifying levees.
Enhancement of habitat conditions for the riparian brush rabbit in habitat areas at and near Caswell State Park on the Stanislaus River (E29). (continued)	3. Excavation, grading, and other construction activities associated with restoration of riparian habitat. 4. Conversion of agricultural and natural habitat to riparian habitat. 5. Chemical or mechanical control of non-native invasive plants. 6. Activities associated with the capture and handling of riparian brush rabbits.

Summary Programmatic Action Outcome	Impact Mechanisms Associated with Program Implementation
Ecosystem Restoration Program (continued)	
Enhancement of habitat conditions for the Suisun song sparrow in occupied habitat areas (E30).	<ol style="list-style-type: none"> 1. In-channel construction activity. 2. Demolition and construction activities associated with setting back or breaching levees and dikes. 3. Construction activities associated with modifying or constructing new levees. 4. Collection and planting of emergent vegetation. 5. Introduction of tidal exchange to existing agricultural and other nontidal habitats. 6. Chemical or mechanical control of non-native invasive plants.
Levee System Integrity Program	
Improvement and maintenance of Delta levees (L1).	<ol style="list-style-type: none"> 1. Demolition, construction, and grading activities. 2. Activities associated with long-term maintenance of levees.
Reduction in the risk to levee stability from subsidence (L2).	<ol style="list-style-type: none"> 1. Demolition, construction, and grading activities.
Improvement and maintenance of Suisun Marsh levees (L3).	<ol style="list-style-type: none"> 1. Demolition, construction, and grading activities. 2. Activities associated with long-term maintenance of levees. 3. Reduction in salinity levels causing habitat conversion.
Water Quality Program	
Reduction of oxygen-depleting substances in the aquatic environment (Q1).	None.
Maintain pathogen loadings below maximum allowed levels and reduce levels of total organic carbon, bromide, and total dissolved solids to increase the availability of water for beneficial uses (Q2).	<ol style="list-style-type: none"> 1. Reduction in the total organic carbon available to primary foodweb organisms.
Reduction of mercury loadings in water and sediment (Q3).	<ol style="list-style-type: none"> 1. In-channel disturbances associated with removing sources of contaminants.
Reduction of pesticide loadings in the aquatic environment (Q4).	<ol style="list-style-type: none"> 1. Change in agricultural land use practices associated with reductions in use of pesticides.
Management of salinity levels in the aquatic environment to improve water quality (Q5).	<ol style="list-style-type: none"> 1. Change in land use practices and cropping patterns on agricultural lands. 2. Changes in timing, stage, and velocity of flows. 3. Changes in patterns of flow in Delta channels.
Reduction of selenium concentrations and loadings to the aquatic environment (Q6).	<ol style="list-style-type: none"> 1. Change in land use practices and cropping patterns on agricultural lands.
Reduction of cadmium, copper, and zinc loadings to levels that do not adversely affect Bay-Delta species or beneficial uses of water (Q7).	<ol style="list-style-type: none"> 1. In-channel disturbances associated with removing sources of contaminants.
Reduction of sediment loadings to levels that do not adversely affect beneficial uses of surface water (Q8).	None.

Table 4-2. Continued

Summary Programmatic Action Outcome	Impact Mechanisms Associated with Program Implementation
Water Use Efficiency Program	
Support implementation of water management techniques that increase the effectiveness of water use management and efficiency for agricultural uses (W1).	<ol style="list-style-type: none"> 1. Reduction in agricultural irrigation and drainage water to support natural habitat areas. 2. Temporary disturbances associated with construction and related activities.
Support implementation of measures that increase agricultural production per unit of water used, protect water quality, or increase environmental benefits while meeting agricultural needs (W2).	<ol style="list-style-type: none"> 1. Reduction in agricultural irrigation and drainage water to support natural habitat areas. 2. Temporary disturbances associated with construction and related activities.
Provide urban water agencies with planning and technical assistance, financing assistance, and assurances for development and implementation of water management plans and best management practices (W3).	None.
Support development and implementation of water recycling projects (W4).	None.
Water Transfer Program	
Implement a framework of actions, policies, and processes that will facilitate transfers and the further development of a statewide water transfer market (T1).	<ol style="list-style-type: none"> 1. Reduction in water to support natural habitat areas. 2. Changes in the timing, stage, velocity, and/or duration of flows.
Watershed Management Program	
Fund and implement watershed restoration, maintenance, conservation, and monitoring activities (M1).	<ol style="list-style-type: none"> 1. Construction or management-related activities that result in removal or alteration of vegetation.
Conveyance Facilities	
Construct and operate modifications to existing south Delta conveyance features (C1).	<ol style="list-style-type: none"> 1. Change in timing and patterns of water movement through the Delta. 2. Change in tidal stage. 3. Demolition, construction, excavation, grading, and maintenance activities associated with construction and operation of facilities. 4. Conversion of agricultural and native habitats to aquatic habitat.
Construct and operate modifications to existing north Delta conveyance features (C2).	<ol style="list-style-type: none"> 1. Change in timing and patterns of water movement through the Delta. 2. Change in tidal stage. 3. Demolition, construction, excavation, grading, and maintenance activities associated with construction and operation of facilities. 4. Conversion of agricultural and native habitats to aquatic habitat.

Summary Programmatic Action Outcome	Impact Mechanisms Associated with Program Implementation
Conveyance Facilities (continued)	
Construct and operate an isolated conveyance facility from the Sacramento River along the eastern side of the Delta to Clifton Court Forebay (C3).	<ol style="list-style-type: none"> 1. Change in timing and patterns of water movement through the Delta. 2. Change in tidal stage. 3. Demolition, construction, excavation, grading, and maintenance activities associated with construction and operation of facilities. 4. Conversion of agricultural and native habitats to aquatic habitat.
Storage Facilities	
Construct and operate enlarged or new surface water storage facilities (S1).	<ol style="list-style-type: none"> 1. Demolition, construction, excavation, grading, and maintenance activities associated with construction and operation of facilities. 2. Conversion of agricultural and native habitats to lacustrine habitat. 3. Changes in river flow downstream of storage reservoirs. 4. Increased levels of recreation-related activity.
Construct and operate new groundwater storage facilities (S2).	<ol style="list-style-type: none"> 1. Demolition, construction, excavation, grading, and maintenance activities associated with construction and operation of facilities. 2. Conversion of agricultural and native habitats to low-quality seasonal wetlands.
Conveyance and Storage Operations	
Implement operating criteria needed to improve water management for beneficial uses (O1).	<ol style="list-style-type: none"> 1. Changes in timing, stage, and/or duration of flows as a result of reoperation of the State Water Project (SWP) and Central Valley Project (CVP).
Implement a Water Management Strategy to provide operational flexibility to achieve environmental benefits (O2).	<ol style="list-style-type: none"> 1. Changes in timing, stage, and/or duration of flows as a result of reoperation of the SWP and CVP.

Table 4-3. Existing Extent (in Acres) of NCCP Habitats Derived from the California Central Valley Wetlands and Riparian Geographic Information Systems¹

Ecological Management Zone	Ecological Management Unit	Aquatic ²	Saline Emergent	Freshwater Permanent Emergent Wetland ³	Seasonal Wetland ⁴	Valley/ Foothill Riparian	Grassland	Woodland, Forest, and Scrub ⁵	Seasonally Flooded Agricultural Lands ⁶	Upland Cropland	Orchards and Vineyards ⁷	Developed and Disturbed ⁷	Area Covered by Data (%)
Delta Region													
Delta Basin	Central and West Delta	34,200	1,100	5,100	500	1,000	33,700	300	18,700	94,700	4,200	18,900	100
	East Delta	3,500	0	1,100	600	600	11,000	2,200	6,300	58,700	3,200	12,000	100
	South Delta	5,700	0	600	400	900	40,300	300	2,100	98,000	7,100	20,800	100
	North Delta	11,000	1	4,700	4,600	1,400	42,300	1,600	15,000	118,200	9,000	29,500	100
	Total	54,300	1,100	11,500	6,200	3,900	127,200	4,400	42,000	369,600	23,500	81,100	100
Bay Region													
Suisun Marsh and San Francisco Bay	Suisun Bay	39,800	33,300	3,100	12,900	300	69,500	1,100	86	1,400	4,600	28,400	70
	Napa River	12,100	4,900	1,100	500	900	27,900	5,500	29	2,400	22,600	18,900	36
	Petaluma River	1,900	4,400	400	200	300	51,900	5,800	19	3,800	84	9,300	83
	San Pablo Bay	70,900	2,100	7	2	4	61	62	0	1	0	300	100
	Sonoma Creek	900	1,500	200	300	400	20,900	1,400	100	4,900	5,200	6,000	39
	Total	125,700	46,100	4,800	13,800	1,900	170,300	13,900	300	12,600	32,600	62,800	59
Sacramento River Region													
Sacramento River	Sacramento River	13,100	0	1,900	2,000	15,300	20,400	400	27,900	54,200	43,000	38,400	92
American River Basin	American Basin	900	0	900	2,000	1,200	112,700	14,100	67,500	19,700	800	50,400	98
	Morrison Creek Watershed	2,200	0	300	500	3,000	89,500	19,500	200	12,200	900	56,000	99
Butte Basin	Antelope Creek	200	0	76	93	100	4,500	600	74	3,000	5,900	1,000	7
	Butte Creek	6	0	7	2	16	5,500	300	0	0	2	200	4
	Butte Sink	1,700	0	6,400	11,700	3,000	52,300	7,600	132,700	46,500	19,800	18,300	97
	Deer Creek	67	0	35	17	400	3,100	89	100	1,500	2,100	500	5
	Mill Creek	100	0	18	70	600	8,100	100	33	1,100	1,200	600	9

Table 4-3. Continued

Ecological Management Zone	Ecological Management Unit	Aquatic ²	Saline Emergent	Freshwater Permanent Emergent Wetland ³	Seasonal Wetland ⁴	Valley/ Foothill Riparian	Grassland	Woodland, Forest, and Scrub ⁵	Seasonally Flooded Agricultural Lands ⁶	Upland Cropland	Orchards and Vineyards ⁷	Developed and Disturbed ⁷	Area Covered by Data (%)
Butte Basin (continued)	Paynes Creek												0
	Pine, Rock, and Big Chico Creeks	600	0	200	200	900	37,600	5,600	6,500	6,100	18,400	12,500	35
	Elder Creek	500	0	34	18	300	8,300	400	84	6,600	3,100	4,900	11
	South Colusa Basin	3,500	0	3,900	14,400	600	127,800	2,000	188,400	169,600	14,900	125,200	81
	Stony Creek	1,100	0	100	300	200	8,200	200	1,300	20,400	7,400	9,400	68
	Thomes Creek	1,100	0	66	46	1,000	35,800	800	300	14,600	13,800	9,200	41
Cottonwood Creek Basin	Lower Cottonwood Creek												0
	Upper Cottonwood Creek												0
Feather River/ Sutter Basin	Bear River	600	0	600	1,000	1,200	45,300	1,500	20,000	16,700	9,600	10,500	100
	Feather River	7,500	0	2,100	700	6,800	21,100	300	6,200	18,800	17,900	12,700	100
	Honcut Creek	400	0	300	800	800	38,000	9,600	25,100	8,100	3,800	6,700	52
	Sutter Basin	1,400	0	1,400	2,800	600	31,900	8,300	91,200	50,100	16,400	25,800	100
	Yuba River	1,700	0	200	90	400	20,900	2,500	1,000	3,100	3,400	6,100	24
North Sacramento Valley Basin	Bear Creek												0
	Battle Creek												0
	Clear Creek												0
	Cow Creek												0
	North Sacramento Valley												0
Yolo Basin	Cache Creek	800	0	300	1,200	300	10,000	600	4,600	15,400	1,800	14,700	62
	Putah Creek	200	0	200	91	200	13,300	1,400	4,900	28,200	2,900	23,400	91
	Willow Slough	1,000	0	300	500	84	17,400	500	21,900	40,600	2,000	28,800	90
	Solano	500	0	100	900	500	74,400	1,100	8,100	24,500	2,500	41,200	94
	Total	39,100	0	19,600	39,300	37,600	786,300	77,600	608,000	561,100	191,900	496,700	49

Table 4-3. Continued

Ecological Management Zone	Ecological Management Unit	Aquatic ²	Saline Emergent	Freshwater Permanent Emergent Wetland ³	Seasonal Wetland ⁴	Valley/ Foothill Riparian	Grassland	Woodland, Forest, and Scrub ⁵	Seasonally Flooded Agricultural Lands ⁶	Upland Cropland	Orchards and Vineyards ⁷	Developed and Disturbed ⁷	Area Covered by Data (%)
San Joaquin River Region													
San Joaquin River	San Joaquin River	5,200	0	2,800	1,800	3,800	40,700	100	3,500	47,700	17,700	16,900	87
East San Joaquin Basin	Chowchilla/ Fresno Rivers	3,900	0	1,700	1,800	600	223,700	1,500	17,300	132,100	151,000	127,900	78
	East San Joaquin Basin												0
	Merced River	1,600	0	500	200	1,800	68,900	300	700	43,400	72,000	38,900	71
	Stanislaus River	1,000	0	500	300	2,200	27,900	400	300	22,600	42,900	17,800	77
	Tuolumne River	7,800	0	600	500	2,300	95,800	1,700	1,600	77,000	84,700	65,000	80
Eastside	Cosumnes River	1,900	0	800	1,500	3,400	169,700	4,200	600	37,700	9,000	10,000	29
Delta Tributaries	Eastside Delta Lowlands Fan	3,800	0	400	1,400	2,600	204,200	3,900	6,100	116,800	94,300	51,900	77
West San Joaquin Basin	Lower West San Joaquin Basin	13,800	0	9,900	31,900	600	156,600	600	39,900	175,600	33,200	93,800	83
	Upper West San Joaquin Basin	800	0	41	99	7	49,800	70	19	4,800	2,600	10,300	9
	Total	39,700	0	17,200	39,500	17,400	1,037,400	12,800	69,900	657,600	507,400	432,500	59

Notes:

¹ Source: California Department of Fish and Game (1997) based on 1993 Landsat Thematic Mapper imagery (blank cells indicate lack of data). The California Central Valley Wetlands and Riparian Geographic Information System (Wetlands GIS) was developed to map wetlands, woody riparian areas, and surrounding land cover to support cooperative conservation planning and wetland resource protection efforts of State, federal, and local agencies and private organizations. The Wetlands GIS database is an ARC/INFO grid with 30-meter grid cells, based on classified Landsat Thematic Mapper and SPOT Multispectral Satellite Imagery. A multitemporal image processing technique was used on imagery from the summer (end of June–early July 1993) and winter (November 1986–January 1993). For the northern San Joaquin River Region, the most recent obtainable Landsat winter data were for 1986 and these data were supplemented with more recent SPOT Multispectral imagery for November 1990. A number of ancillary data sources were

Table 4-3. Continued

used to aid the classification of the imagery into habitat types; these included: National Wetland Inventory, Department of Conservation Farmlands Mapping and Monitoring, San Francisco Estuary Institute Baylands Atlas, Natural Diversity Database, and DFG River Reach Hydrography Data. The habitat classification used in the Wetlands and Riparian GIS differs from Natural Community Conservation Plan (NCCP) habitat type classifications (see MSCS technical report Correlation of NCCP Habitats with Other Classification Systems). The GIS database includes only one aquatic type, while the MSCS addresses four aquatic types. Furthermore, several terrestrial types in the GIS database were combined for area calculation purposes to provide a classification that was more similar to the MSCS classification.

² Includes tidal perennial aquatic, valley riverine aquatic, and lacustrine.

³ Includes tidal freshwater emergent and nontidal freshwater permanent emergent.

⁴ Includes natural seasonal wetland and managed seasonal wetland.

⁵ Includes inland dune scrub, upland scrub, and valley/foothill woodland and forest.

⁶ Includes some permanently flooded agricultural land.

⁷ Not NCCP habitats.

Table 4-4. Existing Extent (in Acres) of NCCP Habitats Derived from the California Gap Analysis Landcover Geographic Information Systems¹

Ecological Management Zone	Ecological Management Unit	Tidal Perennial Aquatic	Valley Riverine Aquatic	Lacustrine	Saline Emergent	Freshwater Permanent ¹ Emergent	Valley / Foothill Riparian	Montane Riparian	Grassland	Upland Scrub	Valley / Foothill Woodland and Forest	Montane Woodland and Forest	Cropland ²	Orchard and Vineyard ³	Barren and Urban ³
Delta Region															
Delta Basin	Central And West Delta	10,000	21,600	4,300		6,600	600		6,100				134,000	12,000	17,800
	East Delta		2,400	200		500	500		200				82,100	400	12,800
	South Delta		700	2,500			1,600		2,600				157,200	6,300	5,100
	North Delta		8,900	500		8,200	82		10,900				191,400	8,900	8,400
	Total	10,000	33,600	7,400		15,400	2,800		19,900				564,700	27,600	44,000
Bay Region															
Suisun Marsh and San Francisco Bay	Suisun Bay	26,400	2,300	500	200	59,800			79,500		32,300	13,600	13,800	10,900	33,800
	Napa River	12,300	21	600	2,300				18,500	32,100	102,700	41,800	18,000	7,300	31,200
	Petaluma River		1,300		6,000				8,800		13,000	2,500	53,200		9,600
	San Pablo Bay	54	2,300		46						7		36		300
	Sonoma Creek	400			400				1,700	25	21,400	27,100	39,900		15,600
	Total	39,100	6,000	1,000	9,000	59,800			108,500	32,100	169,400	85,000	125,000	18,200	90,500
Sacramento River Region															
Sacramento River	Sacramento River		1,500	85		700	32,200		1,200		8,000		140,500	42,200	8,500
American River Basin	American Basin			100		300	500		19,600		3,100		187,900		63,200
	Morrison Creek Watershed		9	700		400	2,400		62,400		5,000	58	24,300	900	89,500
Butte Basin	Antelope Creek			300			5		23,600	3,100	126,000	45,600	8,800	5,000	300
	Butte Creek			500		300			16,300	5,800	30,500	88,100		32	10,400
	Butte Sink			46		19,100	1,400		33,000		17,600	1,000	214,700	21,500	1,800
	Deer Creek					300	1,500		3,700	5,500	13,400	117,500	4,500	400	
	Mill Creek					800	10		13,400	7,200	56,600	50,100	5,300	200	2,700
	Paynes Creek						1,400		1,600	3,700	38,400	6,000			1,000
	Pine, Rock, and Big Chico Creeks						5		47,100	6,200	85,600	59,200	26,600	15,600	11,300

Table 4-4. Continued

Ecological Management Zone	Ecological Management Unit	Tidal Perennial Aquatic	Valley Riverine Aquatic	Lacustrine	Saline Emergent	Freshwater Permanent ¹ Emergent	Valley / Foothill Riparian	Montane Riparian	Grassland	Upland Scrub	Valley / Foothill Woodland and Forest	Montane Woodland and Forest	Cropland ²	Orchard and Vineyard ³	Barren and Urban ³
Sacramento River Region (Continued)															
Colusa Basin	Elder Creek						85		56,400		114,800		40,900	200	2,600
	South Colusa Basin		200	200		31,300			95,900		102,500		541,500	25,900	3,100
	Stony Creek			47			100		13,000		1,900		48,200	4,000	4,000
	Thomes Creek		1,700	100			81		59,000		33,000		89,800	1,100	2,700
Cottonwood Creek Basin	Lower Cottonwood Creek						2		2,500	1,300	158,200				20
	Upper Cottonwood Creek								27,000	91,400	181,300	141,100			1,000
Feather River/Sutter Basin	Bear River			73		300	900		20,700		500		67,000	11,900	5,700
	Feather River		1,300	3,000		700	10,800		7,300		300		36,100	29,100	5,600
	Honcut Creek					300	1,700		20,000		32,500	60,200	50,300	7,000	6,800
	Sutter Basin					2,300	600		13,500		12,500		167,000	29,400	4,600
	Yuba River			1,500					25,700		37,300	74,600	11,200	1,000	11,100
North Sacramento Valley Basin	Bear Creek					600			4,700		57,600	34,500	800		
	Battle Creek					1,800	1,700		1,600	1,000	106,400	157,800			5,900
	Clear Creek			8			200		6,900		155,800	2,300	4,300		34,000
	Cow Creek					300	3,900		9,200	3,900	112,700	119,700	900		
	North Sacramento Valley										700				15
Yolo Basin	Cache Creek		200			6			5,500		12,400		45,100	9,800	6,500
	Putah Creek			17		100	98				5,600	98	62,300	9,400	4,700
	Willow Slough			600		300			5,100		6,100		99,800	12,000	1,800
	Solano			200		100	300		64,500		3,500	300	78,700	10,200	5,700
	Total		5,000	7,500		60,000	59,800		660,200	129,100	1,520,000	958,200	1,956,500	236,800	294,400

Table 4-4. Continued

Ecological Management Zone	Ecological Management Unit	Tidal Perennial Aquatic	Valley Riverine Aquatic	Saline Lacustrine Emergent	Freshwater Permanent Emergent ¹	Valley / Foothill Riparian	Montane Riparian	Grassland	Upland Scrub	Valley / Foothill Woodland and Forest	Montane Woodland and Forest	Cropland ²	Orchard and Vineyard ³	Barren and Urban ³
San Joaquin River Region														
San Joaquin River	San Joaquin River		100	400	2,300	8,500		20,000	46	42		110,800	15,000	4,400
East San Joaquin Basin	Chowchilla/Fresno Rivers			1,200	7,400	1,600		230,600	1,500	2,500		470,000	98,800	29,500
	East San Joaquin Basin							4,300				800		
	Merced River			300	700	1,100		84,600		25,200		133,100	68,600	6,100
	Stanislaus River				200	3,200		26,300		14,500		36,000	60,800	9,100
	Tuolumne River		200	4,100	300	200		96,200		36,000		156,600	87,200	40,000
East Side Delta Tributaries	Consumnes River			2,100	400	3,600	500	183,700	32,400	177,100	284,400	115,400	6,000	12,300
	Eastside Delta Lowlands Fan			6,500	100	1,800		170,200	8,300	82,500		213,100	109,200	35,900
West San Joaquin Basin	Lower West San Joaquin Basin			3,100	7,100	200		164,300	33,000	42		429,200	29,300	4,800
	Upper West San Joaquin Basin			13,600		1,000		355,600	77,700	262,400	1,700	24,700	3,100	4,900
	Total		300	31,300	18,500	21,100	500	1,335,600	152,900	600,200	286,200	1,689,600	477,800	146

Notes:

¹ The California Gap Analysis landcover Geographic Information System database (Gap GIS) was created by the Department of Geography of the University of California, Santa Barbara, as part of the California Gap Analysis Project coordinated by U.S. Geological Survey. The habitats of the Gap GIS were mapped using a 1990 Thematic Mapper satellite image, resampled to 100 x 100-meter cell size, supplemented with 1990 high altitude aerial photography that was overlaid with existing vegetation maps, land use maps, and forest inventory data. Polygons of the land cover GIS layer have been attributed according to several systems, but the California Wildlife Habitat Relationships (WHR) habitat types were used for calculating acreages of NCCP habitats, because the WHR system best matched the level of detail of the NCCP habitat types (see MSCS technical report Correlation of Natural Community Conservation Plan Habitats with Other Classification Systems).

² Includes tidal freshwater emergent and nontidal freshwater emergent.

³ Includes upland cropland and seasonally flooded agricultural land.

⁴ Not NCCP habitat.

Table 4-5. Evaluated Species for Which Direct Mortality as a Result of Implementing CALFED Actions is Prohibited as a Condition of the Multi-Species Conservation Strategy

Multi-Species Conservation Strategy (MSCS) User Guide: The MSCS requires CALFED to avoid all actions that could directly result in the mortality of any species identified in this table. This conservation measure was developed because these species are extremely rare. For many of the plants identified, fewer than a dozen known populations exist.

Common Name	Scientific Name
Birds	
California condor	<i>Gymnogyps californianus</i>
Invertebrates	
California freshwater shrimp	<i>Syncaris pacifica</i>
Calippe silverspot butterfly	<i>Speyeria callippe callippe</i>
Lange's metalmark	<i>Apodemia mormo langei</i>
Mammals	
Riparian brush rabbit	<i>Sylvilagus bachmani riparius</i>
San Joaquin Valley woodrat	<i>Neotoma fuscipes riparia</i>
Plants	
Henderson's bent grass	<i>Agrostis hendersonii</i>
Sharsmith's onion	<i>Allium sharsmithae</i>
Sonoma alopecurus	<i>Alopecurus aequalis</i> var. <i>sonomensis</i>
Large-flowered fiddleneck	<i>Amsinkia grandiflora</i>
Klamath manzanita	<i>Arctostaphylos klamathensis</i>
Contra Costa manzanita	<i>Arctostaphylos manzanita</i> ssp. <i>laevigata</i>
Ione manzanita	<i>Arctostaphylos myrtifolia</i>
Clara Hunt's milk-vetch	<i>Astragalus clarianus</i>
Ferris's milk-vetch	<i>Astragalus tener</i> var. <i>ferrisiae</i>
Lesser saltscale	<i>Atriplex minuscula</i>
Sonoma sunshine	<i>Blennosperma bakeri</i>
Chinese Camp brodiaea	<i>Brodiaea pallida</i>
Tiburon mariposa lily	<i>Calochortus tiburonensis</i>
Stebbins' morning-glory	<i>Calystegia stebbinsii</i>
White sedge	<i>Carex albida</i>
Bristly sedge	<i>Carex comosa</i>
Tree-anemone	<i>Carpenteria californica</i>
Tiburon Indian paintbrush	<i>Castilleja affinis</i> ssp. <i>neglecta</i>
Mason's ceanothus	<i>Ceanothus masonii</i>
Pine Hill ceanothus	<i>Ceanothus roderickii</i>
Sonoma spineflower	<i>Chorizanthe valida</i>
Shasta clarkia	<i>Clarkia borealis</i>
Beaked clarkia	<i>Clarkia rostrata</i>
Mt. Diablo bird's-beak	<i>Cordylanthus nidularius</i>

Common Name	Scientific Name
Plants (continued)	
Palmate-bracted bird's-beak	<i>Cordylanthus palmatus</i>
Ione buckwheat	<i>Eriogonum apricum</i> var. <i>apricum</i>
Irish Hill buckwheat	<i>Eriogonum apricum</i> var. <i>prostratum</i>
Ben Lomond buckwheat	<i>Eriogonum nudum</i> var. <i>decurrens</i>
Loch Lomond button-celery	<i>Eryngium constancei</i>
Diamond-petaled California poppy	<i>Eschscholzia rhombipetala</i>
Pine Hill flannelbush	<i>Fremontodendron californicum</i> ssp. <i>decumbens</i>
El Dorado bedstraw	<i>Galium californicum</i> ssp. <i>sierrae</i>
Hall's tarplant	<i>Hemizonia halliana</i>
Tehama County western flax	<i>Hesperolinon tehamense</i>
Parry's horkelia	<i>Horkelia parryi</i>
Ahart's dwarf rush	<i>Juncus leiospermus</i> var. <i>ahartii</i>
Contra Costa goldfields	<i>Lasthenia conjugens</i>
Pale-yellow layia	<i>Layia heterotricha</i>
Heckard's pepper-grass	<i>Lepidium latipes</i> var. <i>heckardii</i>
Pitkin Marsh lily	<i>Lilium pardalinum</i> ssp. <i>pitkinense</i>
Bellinger's meadowfoam	<i>Limnanthes floccosa</i> ssp. <i>bellingeriana</i>
Butte County meadowfoam	<i>Limnanthes floccosa</i> ssp. <i>californica</i>
Sebastopol meadowfoam	<i>Limnanthes vinculans</i>
Mt. Tedoc linanthus	<i>Linanthus nuttallii</i>
Red-flowered lotus	<i>Lotus rubriflorus</i>
Few-flowered navarretia	<i>Navarretia leucocephala</i> ssp. <i>pauciflora</i>
Many-flowered navarretia	<i>Navarretia leucocephala</i> ssp. <i>plieantha</i>
Pincushion navarretia	<i>Navarretia myersii</i>
Shasta snow-wreath	<i>Neviusia cliftonii</i>
San Joaquin Valley orcutt grass	<i>Orcuttia inaequalis</i>
Hairy orcutt grass	<i>Orcuttia pilosa</i>
Sacramento orcutt grass	<i>Orcuttia viscida</i>
White-rayed pentachaeta	<i>Pentachaeta bellidiflora</i>
Mt. Diablo phacelia	<i>Phacelia phacelioides</i>
Calistoga popcorn-flower	<i>Plagiobothrys strictus</i>
North Coast semaphore grass	<i>Pleuropogon hooverianus</i>
Napa blue grass	<i>Poa napensis</i>
Marin knotweed	<i>Polygonum marinense</i>
Eel-grass pondweed	<i>Potamogeton zosteriformis</i>
California beaked-rush	<i>Rhynchospora californica</i>
Mad-dog skullcap	<i>Scutellaria lateriflora</i>
Red Hills ragwort	<i>Senecio clevelandii</i> var. <i>heterophyllus</i>

Common Name	Scientific Name
Plants (continued)	
Layne's ragwort	<i>Senecio layneae</i>
Marin checkerbloom	<i>Sidalcea hickmanii</i> ssp. <i>viridis</i>
Kenwood Marsh checkbloom	<i>Sidalcea oregana</i> ssp. <i>valida</i>
Mt. Hamilton jewelflower	<i>Streptanthus callistus</i>
Tiburon jewelflower	<i>Streptanthus niger</i>
California seablite	<i>Suaeda californica</i>
Green's tuctoria	<i>Tuctoria greenei</i>
Crampton's tuctoria	<i>Tuctoria mucronata</i>
California vervain	<i>Verbena californica</i>

Table 4-6. Studies and Surveys for “R” and “r” Goal Species

Essential Studies and Surveys Needed to Achieve Recovery Goals ^a	Conditional Studies and Surveys ^{a, b}
<p>Riparian Brush Rabbit (“r”). Identify appropriate methods for implementing a captive breeding program, capturing and handling individuals from wild populations, and reintroducing individuals to establish new populations in suitable existing or restored habitat areas within the riparian brush rabbit’s historic range. Coordinate with the California Department of Parks and Recreation to develop an emergency plan and monitoring system to quickly save individuals and habitat at Caswell Memorial State Park in the event of flooding, wildfire, or epidemic.</p>	<p>Salt Marsh Harvest Mouse (“r”). Conduct research to better determine the salt marsh harvest mouse’s ecological requirements. Use the results of the research when designing and managing restored and enhanced habitat areas to benefit the species. Identify feasible methods for controlling invasive non-native marsh plants and reintroducing the salt marsh harvest mouse into unoccupied suitable enhanced habitats and restored habitat areas.</p>
<p>San Joaquin Valley Woodrat (“r”). Map suitable habitat, and locate woodrat populations along portions of the San Joaquin River and its major tributaries within its historic range. Identify appropriate methods for implementing a captive breeding program, capturing and handling individuals from wild populations, and reintroducing individuals to establish new populations within its historic range in suitable existing or restored habitat areas.</p>	<p>San Pablo California Vole (“r”). Identify feasible methods for controlling invasive non-native marsh plants and reintroducing the San Pablo California vole into unoccupied suitable enhanced habitats and restored habitat areas.</p>
<p>Giant Garter Snake (“r”). Conduct research to better determine the giant garter snake’s ecological requirements. Locate species populations, and determine distribution in the Delta Region to help identify additional actions that should be implemented to recover Delta populations. Research the feasibility of reintroducing the giant garter snake into suitable unoccupied existing and restored habitats in the Delta, Sacramento River, and San Joaquin River Regions.</p>	<p>Suisun Ornate Shrew (“R”). Conduct research to better determine the Suisun ornate shrew’s ecological requirements. Use the results of the research when designing and managing restored and enhanced habitat areas.</p>
<p>Central Valley Fall-/Late-Fall-Run Chinook Salmon ESU (“R”). Identify methods for conducting a population census and determining the distribution of spawning fish in Central Valley streams.</p>	<p>Delta Smelt (“R”). Determine appropriate methods for rearing delta smelt in captivity; evaluate the need to acquire rearing facilities if delta smelt populations continue to decline after restoration actions begin</p>
<p>Green Sturgeon (“R”). Continue to conduct research on the species’ ecological needs, focusing primarily on addressing appropriate harvest levels, and to analyze the operations of upstream migration barriers such as Red Bluff Diversion Dam.</p>	<p>Sacramento Perch (“r”). Determine appropriate methods for rearing Sacramento perch in captivity; evaluate the need to acquire rearing facilities to provide fish for introductions if Sacramento perch populations continue to decline after restoration actions begin. Determine methods for reestablishing populations in habitats not populated by non-native predators and identify suitable locations for establishing additional populations.</p>
	<p>Valley Elderberry Longhorn Beetle (“R”). Determine the maximum distance the species can disperse from occupied habitat to colonize suitable unoccupied habitat.</p>
	<p>Alkali Milkvetch (“r”). Research applicable reintroduction techniques so that the species can be reintroduced to portions of its historic range where it is extirpated.</p>

Essential Studies and Surveys Needed to Achieve Recovery Goals ^a	Conditional Studies and Surveys ^{a, b}
<p>Delta Green Ground Beetle ("r"). Survey suitable habitat, including large pools associated with pescadero soils, to establish the current species range. Conduct research to develop a greater understanding of the species' life history, including larval requirements and the ecology of prey species (especially springtail). Use the results of the research to understand habitat requirements and develop management prescriptions to promote and ensure population viability. Identify appropriate methods for reintroduction to establish new populations within the species' historic range.</p>	<p>Bristly Sedge ("r"). Research habitat requirements and potential conservation measures. Design conservation measures based on the results of the research.</p>
<p>Lange's Metalmark ("R"). Identify appropriate methods for propagating the Lange's metalmark butterfly's host plant, a subspecies of the naked buckwheat (<i>Eriogonum nudum</i> var. <i>auriculatum</i>), and for establishing host plant populations in enhanced and restored habitat.</p>	<p>Delta Coyote-Thistle ("r"). Research the species' ecology to formulate strategies for recovery.</p>
<p>Alkali Milkvetch ("r"). Conduct inventory and surveys to determine species status and distribution, and define restoration needs.</p>	<p>Delta Mudwort ("r"). Research the extent and physical and biological qualities of existing habitat and populations prior to levee or restoration actions.</p>
<p>Antioch Dunes Evening-Primrose ("R"). Identify appropriate methods for propagating the plant and for establishing species populations in enhanced and restored habitat.</p>	<p>Mason's Lilaeopsis ("R"). Conduct research into the extent and physical and biological qualities of existing habitat and populations before levee or restoration actions begin.</p>
<p>Suisun Thistle ("R"). Research habitat requirements and reasons for rarity. Determine microhabitat requirements and habitat management needs necessary to design and implement habitat enhancement and management measures.</p>	<p>Northern California Black Walnut ("r"). Research species ecology (such as dispersal mechanisms and use by other species). Use the results of the research to form restoration, protection, and management strategies for contributing to species recovery.</p>
<p>Soft Bird's-Beak ("R"). Research habitat requirements and reasons for rarity. Determine microhabitat requirements, including salinity, and other habitat management needs.</p>	<p>Suisun Thistle ("R"). Study vulnerability to hybridization with non-native <i>Cirsium</i> species, and design measures to control non-native <i>Cirsium</i> where hybridization is likely to occur. Study vulnerability to agents for biological control of non-native thistles, and design actions to reduce the effects of these agents when effects are likely.</p>
Notes:	
^a Species goals shown in parentheses.	
^b To be implemented if conservation measures not to produce expected levels of species benefit.	

Table 4-7. Summary Effect of Implementing CALFED Actions and Conservation Measures on
NCCP Communities

Multi-Species Conservation Strategy (MSCS) User Guide: This table presents the expected summary effect of implementing all CALFED actions with MSCS conservation measures that were developed to avoid, minimize, and compensate for CALFED impacts on Natural Community Conservation Plan (NCCP) habitats and fish groups throughout the MSCS Focus Area. The summary effect on NCCP habitats and fish groups of implementing CALFED actions comes from the analysis presented in the MSCS technical report Evaluation Tables and Multi-Species Conservation Strategy Conservation Measures for Natural Community Conservation Plan Communities.

Community	Summary Effect
Tidal perennial aquatic	Restoration of up to 9,000 acres of shallow tidal perennial aquatic habitat in the Delta and Bay Regions, and potential for restoration or enhancement of tidal perennial aquatic habitat as a secondary effect of CALFED restoration measures implemented in flows, floodplains, and tidal slough habitats within the Bay and Delta Regions. Potential for short-term loss or degradation of existing habitat area and potential for long-term increase in habitat area as CALFED implements conservation measures.
Valley riverine aquatic	Potential for substantial increases in shaded riverine aquatic (SRA) and instream habitats and improved stream temperatures along the Sacramento and San Joaquin Rivers and their tributaries, and along North Bay tributaries, as a result of enhancing or restoring up to 11,789 acres of riparian habitat along stream channels; restoration of floodplain and channel meander processes along major tributaries in the Sacramento River and San Joaquin River Regions through protection and enhancement of up to 26,000 acres of stream channel meander corridor and improvement in the passage of anadromous fish to and from habitat areas. Potential for permanent fragmentation of valley riverine aquatic habitat corridors if new reservoirs are constructed in existing habitat areas.
Montane riverine aquatic	Potential for increase in SRA and instream habitats and improved stream temperatures along the Sacramento and San Joaquin Rivers and North Bay tributaries, and improvement in the passage of anadromous fish to and from habitat areas. Potential for permanent fragmentation of montane riverine aquatic habitat corridors if new reservoirs are constructed in existing habitat areas.
Lacustrine	Restoration of up to 1,600 acres of lacustrine habitat adjacent to existing and restored wetlands in the Bay Region. Potential for substantial increases in lacustrine habitat area associated with reservoir construction, and for restoration or enhancement of lacustrine habitat as a secondary effect of CALFED actions to restore and enhance wetlands, agricultural habitats, and floodplains in all Regions. Potential for loss or degradation of existing habitat areas, such as stock ponds, in some locations.
Saline emergent	Protection and enhancement of 6,200 acres of existing tidal saline emergent habitat and restoration of 7,500–12,000 acres of tidal saline emergent habitat area in the Bay Region. Restoration of habitat in up to 425 acres of restored tidal sloughs in the Bay Region. Potential short-term loss of tidal and nontidal habitat area from implementation of CALFED actions and a long-term increase in habitat area as CALFED implements conservation measures.
Tidal freshwater emergent	Increase of 30,200–45,800 acres in tidal freshwater emergent habitat area in the Delta Region as a result of restoration. Long-term protection of up to 800 acres of existing habitat areas associated with channel islands. Restoration of habitat in up to 1,575 acres of restored tidal sloughs and enhancement of habitat resulting from control of non-native aquatic plants. Potential short-term loss of habitat area from implementation of CALFED actions and long-term increase in habitat area once CALFED implements conservation measures.

Community	Summary Effect
Nontidal freshwater permanent emergent	Restoration of up to 19,600 acres of nontidal freshwater permanent emergent wetlands in the Delta Region, including 2,600 acres of open-water areas within restored wetlands. Potential for restoration or enhancement of emergent wetlands in all regions incidental to restoration and enhancement of seasonal wetland habitats and floodplains. Potential for short-term loss or degradation of existing wetland habitats and long-term increase in habitat area as CALFED implements conservation measures.
Natural seasonal wetland	Protection, enhancement, and/or restoration of 100 acres of vernal pools and 500–1,000 acres of surrounding buffer habitat in the Bay Region. Potential for protection or enhancement of existing and creation of additional seasonal wetlands as a secondary result of other CALFED actions. Potential for short-term loss or degradation of existing natural seasonal wetland habitats and long-term increase in habitat area as CALFED implements conservation measures.
Managed seasonal wetland	Potential for an increase of up to 29,500 acres of managed seasonal wetland in the Delta and Bay Regions and an increase in habitat values provided for wildlife on as many as 308,125 acres of existing managed seasonal wetlands in all regions. Potential increase in the managed seasonal wetlands habitat area in the Delta and Bay Regions as a secondary result of CALFED conservation measures implemented in other wetland habitats. Potential for short-term loss or degradation of existing managed seasonal wetland habitats and long-term increase in habitat area as CALFED implements conservation measures.
Valley/foothill riparian	Restoration of up to 11,789 acres of riparian habitat along up to 235 miles of river and stream channels throughout the Focus Area. Protection and enhancement of 500 acres of riparian habitat in the Delta Region. Enhancement and restoration of riparian habitat associated with the enhancement of as many as 26,000 acres of stream channel meander corridors in the Sacramento and San Joaquin River Regions. Enhancement of existing riparian habitats throughout the Focus Area by reducing populations of invasive non-native plants. An unknown quantity of riparian habitat would also be expected to naturally establish itself as a result of CALFED actions to restore or enhance tidal sloughs and channel islands in the Delta and wetlands throughout the Focus Area. Potential for short-term loss or degradation of existing habitat area and for long-term increase in habitat area once CALFED has implemented conservation measures. Potential for permanent fragmentation of valley/foothill riparian corridors if new surface storage facilities are constructed in existing habitat areas.
Montane riparian	Potential for increase in and greater connectivity among montane riparian habitat areas along tributaries to the Sacramento and San Joaquin Rivers and to the North Bay. Potential for short-term loss or degradation of existing habitat area and for long-term increase in habitat area once CALFED implements conservation measures. Potential for permanent fragmentation of montane riparian corridors if new surface storage facilities are constructed in existing habitat areas.
Grassland	Potential for an increase of 9,000–11,000 acres of perennial grassland in the Delta and Bay Regions and an increase in and/or enhancement of habitat area associated with restoration and enhancement of seasonal wetlands. An overall reduction in the area's annual grassland is expected in some locations (primarily in the Sacramento and San Joaquin River Regions) as a result of restoration of channel, wetland, and riparian habitats and construction of conveyance, storage, and other facilities or structures necessary to achieve CALFED objectives.
Inland dune scrub	Increase in inland dune scrub habitat area of 50–100 acres within and adjacent to the Antioch Dunes Ecological Reserve. Enhancement and increased level of protection of existing dune scrub habitat area within the Antioch Dunes Ecological Reserve. Potential increases in the populations of evaluated species present at the Antioch Dunes Ecological Reserve.

Table 4-7. Continued

Community	Summary Effect
Upland scrub	Potential for permanent loss of habitat area with construction of new or enlarged storage reservoirs and associated facilities.
Valley/foothill woodland and forest	Potential for increase in habitat area near affected channels in the Sacramento and San Joaquin River Regions as a result of restoring floodplains. Potential for permanent loss of habitat area with construction of new or enlarged storage reservoirs and associated facilities. Potential long-term increase in and/or enhancement of habitat area once CALFED implements conservation measures.
Montane woodland and forest	Potential for permanent loss of habitat area with construction of new or enlarged storage reservoirs and associated facilities. Potential long-term increase in and/or enhancement of habitat area once CALFED implements conservation measures.
Upland cropland	Potential for substantial losses of upland cropland habitat containing high wildlife foraging habitat value for associated species (primarily in the Delta Region) as a result of CALFED actions. Overall forage availability for species that use upland cropland habitats, however, could increase substantially with the restoration or enhancement of natural foraging habitat areas, management of as many as 389,000 acres of agricultural lands (upland cropland and seasonally flooded agricultural lands) to improve wildlife habitat values, and implementation of conservation measures to compensate for CALFED impacts on evaluated species.
Seasonally flooded agricultural lands	Potential for substantial losses of seasonally flooded agricultural lands containing high wildlife foraging habitat value for associated species (primarily in the Delta Region) as a result of CALFED actions. Overall forage availability for species that use seasonally flooded agricultural habitats, however, could increase substantially with the restoration or enhancement of natural foraging habitat areas, management of as many as 389,000 acres of agricultural lands (upland cropland and seasonally flooded agricultural lands) to improve wildlife habitat values, and implementation of conservation measures to compensate for CALFED impacts on evaluated species.
Anadromous fish species	Substantial improvement in anadromous fish habitat and restoration of fish populations to levels ensuring long-term viability of individual runs and species.
Estuarine fish species	Substantial improvement in estuarine fish habitat and restoration of fish populations to levels ensuring long-term viability of the species.

Table 4-8. Summary of Ecosystem Restoration Program Habitat Restoration and Enhancement Targets

NCCP Habitat	Applicable CALFED Regions ¹				Restored ² (acres)	Enhanced ² (acres)
	D	B	SR	SJR		
Tidal perennial aquatic	X	X			9,000 ^{3,4}	0
Saline emergent		X			7,500–12,000 ⁴	6,200
Tidal freshwater emergent	X				30,200–45,800 ^{4,5}	0
Nontidal freshwater permanent emergent	X				19,600 ⁶	0
Lacustrine		X			1,600	0
Managed seasonal wetland	X	X	X	X	29,000–29,500	308,125
Natural seasonal wetland		X			0	100
Valley/foothill riparian and montane riparian	X	X	X	X	11,789 ⁴	18,000–26,000 ⁷
Grassland	X	X	X		9,000–11,000	0 ⁸
Inland dune scrub	X				0	50–100
Seasonally flooded agriculture and upland cropland	X		X	X	0	353,933–388,933

Notes:

¹ D = Delta Region; B = Bay Region; SR = Sacramento River Region; SJR = San Joaquin River Region.

² Restored habitat will create new habitat area, resulting in an increase in the extent of habitat. Enhanced habitat will not result in an increase in total habitat area.

³ Acreage shown includes restoration of 500 acres of shoals in the Delta Region.

⁴ Acreages do not include restored tidal sloughs. A portion of tidal sloughs restored under the Ecosystem Restoration Program (ERP) could result in restoration of tidal perennial aquatic habitat in the Delta and Bay Regions; saline emergent habitat in the Bay Region; and tidal freshwater emergent and valley/foothill riparian habitats in the Delta Region.

⁵ Acreage shown includes restoration or enhancement of 200–800 acres of the midchannel islands in the Delta. A portion of restored or enhanced midchannel islands could result in restoration of additional tidal emergent wetlands.

⁶ Acreage shown includes ERP nontidal aquatic habitat to be restored within nontidal freshwater permanent emergent habitat.

⁷ Acres of stream channel meander corridor to be enhanced or restored under the ERP. These corridors are expected to encompass and enhance existing riparian habitat area and to restore habitat area by restoring the ecological processes that create and sustain riparian habitat.

⁸ Not included in this acreage are ERP actions to enhance an undefined quantity of grassland in association with enhancement of seasonal wetlands in the American River Basin Ecological Management Zone.

Table 4-9. Comparison of Existing NCCP Habitat Area and Ecosystem Restoration Program Target Restoration Habitat Area for the Delta Ecological Management Zone and Ecological Management Units

	Central and West Delta	East Delta	North Delta	South Delta	Total
Existing Habitat Area (acres)					
Aquatic ¹	34,200	3,500	11,000	5,700	54,400
Seasonal wetland	500	600	4,600	400	6,200
Freshwater permanent emergent wetland ²	5,100	1,100	4,700	600	11,500
Valley/foothill riparian	1,000	600	1,400	900	3,900
Ecosystem Restoration Program Habitat Restoration Area (acres)					
Aquatic ^{1,3}	2,500	1,000	1,500	2,000	70,003
Seasonal wetland	8,000	6,000	2,000	12,000	28,000
Freshwater permanent emergent wetland ²	ND	ND	ND	ND	49,600–64,600 ⁴
Valley/foothill riparian	0	ND	ND	ND	1,195–1,284 ⁴
Percent Increase in Habitat Area with Implementation of the Ecosystem Restoration Program					
Aquatic ¹	7	29	14	35	13
Seasonal wetland	1,600	1,000	43	3,000	451
Freshwater permanent emergent wetland ²	ND	ND	ND	ND	431–562
Valley/foothill riparian	0	17–33	18–32	72–128	26–46

Note: Existing habitat extent calculated from the California Central Valley Wetlands and Riparian Geographic Information System (California Department of Fish and Game 1997).

¹ Includes tidal perennial aquatic Natural Community Conservation Plan (NCCP) habitat.

² Includes tidal freshwater emergent and nontidal freshwater permanent emergent NCCP habitat types.

³ Shoal habitat was assumed to be converted from other aquatic habitat and was not included.

⁴ Allocation of the restored habitat area among ecological management units has not been determined.

ND = No data.

Table 4-10. Potential for Adverse Effects of CALFED Actions on Evaluated Species

Multi-Species Conservation Strategy (MSCS) User Guide: This table identifies the evaluated species and the MSCS goal for each species. It also identifies CALFED's conclusion regarding the potential adverse effects on evaluated species of implementing its actions in compliance with the requirements of Section 7 of the federal Endangered Species Act (FESA). A "No Effect" conclusion means that proposed CALFED actions will have no adverse or beneficial effects on the species. A "Not Likely to Adversely Affect" conclusion means that potential effects on the species are expected to be discountable, insignificant, or completely beneficial. A "Likely to Adversely Affect" conclusion means that adverse effects on the species may occur as a direct or indirect result of CALFED or any interrelated or interdependent actions. The "Likely to Adversely Affect" conclusion is appropriate when 1) CALFED as a whole is likely to be beneficial, but there could still be some small adverse effects; and 2) the level of detail provided for proposed actions is such that it is not possible to fully determine the nature of effects. In this latter instance, FESA requires that the analysis should assume that actions would have an adverse effect. Where a species is identified in this table as likely to be adversely affected by proposed CALFED actions, the MSCS prescribes conservation measures designed to avoid, minimize, and compensate for the adverse effects.

This evaluation of potential adverse effects on evaluated species assumes that all proposed CALFED actions are implemented. Consequently, if certain actions are not implemented, the potential effects on species and conclusions in this table may change.

The purpose of this evaluation is to identify potential direct and indirect adverse effects on the evaluated species, not to determine the "net effect" of the adverse and beneficial effects of the various proposed CALFED actions when considered together. The assessment of the aggregated, long-term effects of the proposed CALFED actions on evaluated species is presented in Table 4-11.

Evaluated Species	MSCS Species Goal	No Effect	May Affect	
			Not Likely to Adversely Affect	Likely to Adversely Affect
Mammals				
California wolverine <i>Gulo gulo luteus</i>	m		X	
Giant kangaroo rat <i>Dipodomys ingens</i>	m			X
Greater western mastiff-bat <i>Eupomops perotis californicus</i>	m			X
Merced kangaroo rat <i>Dipodomys heermanni dixonii</i>	m			X
Nelson's antelope ground squirrel <i>Ammospermophilus nelsoni</i>	m			X
Ringtail <i>Bassariscus astutus</i>	m			X
Riparian brush rabbit <i>Sylvilagus bachmanii riparius</i>	r			X
Salt marsh harvest mouse <i>Reithrodontomys raviventris</i>	r			X
San Joaquin kit fox <i>Vulpes macrotis mutica</i>	m			X
San Joaquin Valley woodrat <i>Neotoma fuscipes riparia</i>	r			X

Table 4-10. Continued

Evaluated Species	MSCS Species Goal	No Effect	May Affect	
			Not Likely to Adversely Affect	Likely to Adversely Affect
Mammals (continued)				
San Pablo California vole <i>Microtus californicus sanpabloensis</i>	r			X
Suisun ornate shrew <i>Sorex ornatus sinuosus</i>	R			X
Birds				
Aleutian Canada goose <i>Branta canadensis leucopareia</i>	m			X
American peregrine falcon <i>Falco peregrinus anatum</i>	m			
Bald eagle <i>Haliaeetus leucocephalus</i>	m			X
Bank swallow <i>Riparia riparia</i>	r			X
Black-crowned night heron (rookery) <i>Nycticorax nycticorax</i>	m			X
Black tern <i>Chlidonias niger</i>	m			X
California black rail <i>Laterallus jamaicensis coturniculus</i>	r			X
California brown pelican <i>Pelecanus occidentalis californicus</i>	m	X		
California clapper rail <i>Rallus longirostris obsoletus</i>	r			X
California condor <i>Gymnogyps californianus</i>	m		X	
California gull <i>Larus californicus</i>	m			X
California least tern <i>Sterna antillarum browni</i>	m	X		
California yellow warbler <i>Dendroica petechia brewsteri</i>	r		X	
Cooper's hawk <i>Accipiter cooperi</i>	m			X
Double-crested cormorant (rookery) <i>Phalarocorax auritus</i>	m			X
Golden eagle <i>Aquila chrysaetos</i>	m			X

Table 4-10. Continued

Evaluated Species	MSCS Species Goal	No Effect	May Affect	
			Not Likely to Adversely Affect	Likely to Adversely Affect
Birds (continued)				
Grasshopper sparrow <i>Ammodramus savannarum</i>	m			X
Great blue heron (rookery) <i>Ardea herodias</i>	m			X
Great egret (rookery) <i>Casmerodius albus</i>	m			X
Greater sandhill crane <i>Grus canadensis tabida</i>	r			X
Least Bell's vireo <i>Vireo bellii pusillus</i>	r			
Little willow flycatcher <i>Empidonax traillii brewsteri</i>	r		X	
Long-billed curlew <i>Numenius americanus</i>	m			X
Long-eared owl <i>Asio otus</i>	m			X
Mountain plover <i>Charadrius montanu</i>	m		X	
Northern harrier <i>Circus cyaneus</i>	m			X
Northern spotted owl <i>Strix occidentalis caurina</i>	m		X	
Northern spotted owl critical habitat			X	
Osprey <i>Pandion haliaetus</i>	m			X
Saltmarsh common yellowthroat <i>Geothlypis trichas sinuosa</i>	r			X
San Pablo song sparrow <i>Melospiza melodia samuelis</i>	R			X
Short-eared owl <i>Asio flammeus</i>	m			X
Snowy egret (rookery) <i>Egretta thula</i>	m			X
Suisun song sparrow <i>Melospiza melodia maxillaris</i>	R			X
Swainson's hawk <i>Buteo swainsoni</i>	r			X
Tricolored blackbird <i>Agelaius tricolor</i>	m			X

Table 4-10. Continued

Evaluated Species	MSCS Species Goal	No Effect	May Affect	
			Not Likely to Adversely Affect	Likely to Adversely Affect
Birds (continued)				
Western burrowing owl <i>Athene cunicularia hypugea</i>	m			X
Western least bittern <i>Ixobrychus auritus</i>	m		X	
Western snowy plover <i>Charadrius alexandrinus nivosus</i>	m			X
Western yellow-billed cuckoo <i>Coccyzus americanus occidentalis</i>	r			X
White-faced ibis <i>Plegadis chihi</i>	m			X
White-tailed kite <i>Elanus leucurus</i>	m			X
Yellow-breasted chat <i>Iceteria virens</i>	m			X
Reptiles				
Alameda whipsnake <i>Masticophis lateralis euryxanthus</i>	m			X
Blunt-nosed leopard lizard <i>Gambelia silus</i>	m			X
Giant garter snake <i>Thamnophis gigas</i>	r			X
San Joaquin whipsnake <i>Masticophis flagellum ruddocki</i>	m			X
Western pond turtle <i>Clemmys marmorata</i>	m			X
Amphibians				
California red-legged frog <i>Rana aurora draytoni</i>	m			X
California tiger salamander <i>Ambystoma californiense</i>	m			X
Foothill yellow-legged frog <i>Rana boylli</i>	m			X
Limestone salamander <i>Hydromantes brunus</i>	m	X		
Shasta salamander <i>Hydromantes shastae</i>	m			X
Western spadefoot <i>Scaphiopus hammondii</i>	m			X

Table 4-10. Continued

Evaluated Species	MSCS Species Goal	No Effect	May Affect	
			Not Likely to Adversely Affect	Likely to Adversely Affect
Fishes				
Central California Coast steelhead evolutionarily significant unit (ESU) <i>Oncorhynchus mykiss</i>	m			X
Central California Coast steelhead ESU critical habitat				X
Central Valley fall-/late-fall-run chinook salmon ESU <i>Oncorhynchus tshawytscha</i> (fr)	R			X
Central Valley spring-run chinook salmon ESU <i>Oncorhynchus tshawytscha</i> (sr)	R			X
Central Valley spring-run chinook salmon ESU critical habitat	R			X
Central Valley steelhead ESU <i>Oncorhynchus mykiss</i>	R			X
Central Valley steelhead ESU critical habitat	R			X
Delta smelt <i>Hypomesus transpacificus</i>	R			X
Delta smelt critical habitat				X
Green sturgeon <i>Acipenser medirostris</i>	R			X
Hardhead <i>Mylopharodon conocephalus</i>	m			X
Longfin smelt <i>Spirinchus thaleichthys</i>	R			X
McCloud river redband trout <i>Oncorhynchus mykiss</i> ssp. 2	m			X
Rough sculpin <i>Cottus asperimui</i>	m			X
Sacramento perch <i>Archoplites interruptus</i>	r		X	
Sacramento splittail <i>Pogonichthys macrolepidotus</i>	R			X
Tidewater goby <i>Eucyclogobius newberryi</i>	m		X	
Sacramento River winter-run chinook salmon ESU <i>Oncorhynchus tshawytscha</i> (wr)	R			X

Table 4-10. Continued

Evaluated Species	MSCS Species Goal	No Effect	May Affect	
			Not Likely to Adversely Affect	Likely to Adversely Affect
Fishes (continued)				
Sacramento River winter-run chinook salmon ESU critical habitat				X
Invertebrates				
California freshwater shrimp <i>Syncaris pacifica</i>	m		X	
Callippe silverspot <i>Speyeria callippe callippe</i>	m	X		
Conservancy fairy shrimp <i>Branchinecta conservatio</i>	m			X
Delta green ground beetle <i>Elaphrus viridis</i>	r			X
Delta green ground beetle critical habitat				X
Lange's metalmark <i>Apodemis mormo langei</i>	R			X
Longhorn fairy shrimp <i>Branchinecta longiantenna</i>	m			X
Mid-valley fairy shrimp <i>Branchinecta n. sp. "mid-valley"</i>	m			X
Monarch butterfly (roost) <i>Danaus plexippus</i>	m	X		
Shasta sideband <i>Monadenia troglodytes</i>	m			X
Valley elderberry longhorn beetle <i>Desmocerus californicus dimorphus</i>	R			X
Valley elderberry longhorn beetle critical habitat				X
Vernal pool fairy shrimp <i>Branchinecta lynchi</i>	m			X
Vernal pool tadpole shrimp <i>Lepidurus packardii</i>	m			X
Plants				
Henderson's bent grass <i>Agrostis hendersonii</i>	m			X
Sharsmith's onion <i>Allium sharsmithae</i>	m	X		
Rawhide Hill onion <i>Allium tuolumnense</i>	m			X

Table 4-10. Continued

Evaluated Species	MSCS Species Goal	No Effect	May Affect	
			Not Likely to Adversely Affect	Likely to Adversely Affect
Plants (continued)				
Sonoma alopecurus				
<i>Alopecurus aequalis</i> var. <i>sonomensis</i>	m	X		
Large-flowered fiddleneck				
<i>Amsinckia grandiflora</i>	m	X		
Large-flowered fiddleneck critical habitat		X		
Dimorphic snapdragon				
<i>Antirrhinum subcordatum</i>	m			X
Mt. Diablo manzanita				
<i>Arctostaphylos auriculata</i>	m			X
Baker's manzanita				
<i>Arctostaphylos bakeri</i> ssp. <i>bakeri</i>	m	X		
Klamath manzanita				
<i>Arctostaphylos klamathensis</i>	m	X		
Contra Costa manzanita				
<i>Arctostaphylos manzanita</i> ssp. <i>laevigata</i>	m			X
Ione manzanita				
<i>Arctostaphylos myrtifolia</i>	m	X		
Pallid manzanita				
<i>Arctostaphylos pallida</i>	m	X		
Suisun Marsh aster				
<i>Aster lentus</i>	R			X
Clara Hunt's milk-vetch				
<i>Astragalus clarianus</i>	m	X		
Big Bear Valley woollypod				
<i>Astragalus leucolobus</i>	m			X
Jepson's milk-vetch				
<i>Astragalus rattanii</i> var. <i>jepsonianus</i>	m			X
Ferris's milk-vetch				
<i>Astragalus tener</i> var. <i>ferrisiae</i>	m	X		
Alkali milk-vetch				
<i>Astragalus tener</i> var. <i>tener</i>	r			X
Heartscale				
<i>Atriplex cordulata</i>	m			X
Brittlescale				
<i>Atriplex depressa</i>	m			X

Table 4-10. Continued

Evaluated Species	MSCS Species Goal	No Effect	May Affect	
			Not Likely to Adversely Affect	Likely to Adversely Affect
Plants (continued)				
San Joaquin spearscale <i>Atriplex joaquiniana</i>	m			X
Lesser saltscale <i>Atriplex minuscula</i>	m	X		
Vernal pool smallscale <i>Atriplex persistens</i>	m	X		
Lost Hills crownscale <i>Atriplex vallicola</i>	m			X
Sonoma sunshine <i>Blennosperma bakeri</i>	m	X		
Big tarplant <i>Blepharizonia plumosa</i> ssp. <i>plumosa</i>	m			X
Indian Valley brodiaea <i>Brodiaea coronaria</i> ssp. <i>rosea</i>	m			X
Chinese Camp brodiaea <i>Brodiaea pallida</i>	m	X		
Mt. Diablo fairy-lantern <i>Calochortus pulchellus</i>	m			X
Tiburon Mariposa lily <i>Calochortus tiburonensis</i>	m	X		
Stebbins' morning-glory <i>Calystegia stebbinsii</i>	m	X		
San Benito evening-primrose <i>Camissonia benitensis</i>	m			X
Sharsmith's harebell <i>Campanula sharsmithiae</i>	m			X
White sedge <i>Carex albida</i>	m	X		
Bristly sedge <i>Carex comosa</i>	r			X
Tree-anemone <i>Carpenteria californica</i>	m			X
Tiburon Indian paintbrush <i>Castilleja affinis</i> ssp. <i>neglecta</i>	m	X		
Succulent owl's-clover <i>Castilleja campestris</i> ssp. <i>succulenta</i>	m			X
Mason's ceanothus <i>Ceanothus masonii</i>	m	X		

Evaluated Species	MSCS Species Goal	No Effect	May Affect	
			Not Likely to Adversely Affect	Likely to Adversely Affect
Plants (continued)				
Pine Hill ceanothus <i>Ceanothus roderickii</i>	m	X		
Hoover's spurge <i>Chamaesyce hooveri</i>	m			X
Dwarf soaproot <i>Chlorogalum pomeridianum</i> var. <i>minus</i>	m			X
Sonoma spineflower <i>Chorizanthe valida</i>	m	X		
Slough thistle <i>Cirsium crassicaule</i>	m			X
Suisun thistle <i>Cirsium hydrophilum</i> var. <i>hydrophilum</i>	R			X
Mariposa clarkia <i>Clarkia biloba</i> ssp. <i>australis</i>	m			X
Shasta clarkia <i>Clarkia borealis</i> ssp. <i>arida</i>	m			X
Beaked clarkia <i>Clarkia rostrata</i>	m			X
Point Reyes bird's-beak <i>Cordylanthus maritimus</i> ssp. <i>palustris</i>	r			X
Hispid bird's-beak <i>Cordylanthus mollis</i> ssp. <i>hispidus</i>	m		X	
Soft bird's-beak <i>Cordylanthus mollis</i> ssp. <i>mollis</i>	R			X
Mt. Diablo bird's-beak <i>Cordylanthus nidularius</i>	m	X		
Palmate-bracted bird's-beak <i>Cordylanthus palmatus</i>	m			X
Mt. Hamilton coreopsis <i>Coreopsis hamiltonii</i>	m			X
Silky cryptantha <i>Cryptantha crinita</i>	m			X
Baker's larkspur <i>Delphinium bakeri</i>	m	X		
Hospital Canyon larkspur <i>Delphinium californicum</i> ssp. <i>interius</i>	m			X

Table 4-10. Continued

Evaluated Species	MSCS Species Goal	No Effect	May Affect	
			Not Likely to Adversely Affect	Likely to Adversely Affect
Plants (continued)				
Yellow larkspur <i>Delphinium luteum</i>	m	X		
Recurved larkspur <i>Delphinium recurvatum</i>	m			X
Four-angled spikerush <i>Eleocharis quadrangulata</i>	m			X
Brandegee's eriastrum <i>Eriastrum brandegeae</i>	m			X
Hoover's eriastrum <i>Eriastrum hooveri</i>	m			X
Ione buckwheat <i>Eriogonum apricum</i> var. <i>apricum</i>	m	X		
Irish Hill buckwheat <i>Eriogonum apricum</i> var. <i>prostratum</i>	m	X		
Ben Lomond buckwheat <i>Eriogonum nudum</i> var. <i>decurrens</i>	m			X
Loch Lomond button-celery <i>Eryngium constancei</i>	m	X		
Delta coyote-thistle <i>Eryngium racemosum</i>	r			X
Spiny-sepaled button-celery <i>Eryngium spinosepalum</i>	m			X
Contra Costa wallflower <i>Erysimum capitatum</i> ssp. <i>angustatum</i>	R			X
Contra Costa wallflower critical habitat				X
Diamond-petaled California poppy <i>Eschscholzia rhombipetala</i>	m			X
Pine Hill flannelbush <i>Fremontodendron decumbens</i>	m	X		
Adobe-lily <i>Fritillaria pluriflora</i>	m			X
El Dorado bedstraw <i>Galium californicum</i> ssp. <i>sierrae</i>	m	X		
Boggs Lake hedge-hyssop <i>Gratiola heterosepala</i>	m			X

Table 4-10. Continued

Evaluated Species	MSCS Species Goal	No Effect	May Affect	
			Not Likely to Adversely Affect	Likely to Adversely Affect
Plants (continued)				
Diablo helianthella <i>Helianthella castanea</i>	m			X
Hall's tarplant <i>Hemizonia halliana</i>	m			X
Congdon's tarplant <i>Hemizonia parryi</i> ssp. <i>congdonii</i>	m			X
Brewer's western flax <i>Hesperolinon breweri</i>	m			X
Marin western flax <i>Hesperolinon congestum</i>	m	X		
Drymaria-like western flax <i>Hesperolinon drymarioides</i>	m			X
Napa western flax <i>Hesperolinon serpentinum</i>	m			X
Tehama County western flax <i>Hesperolinon tehamense</i>	m			X
Rose-mallow <i>Hibiscus lasiocarpus</i>	m			X
Santa Cruz tarplant <i>Holocarpha macradenia</i>	m	X		
Parry's horkelia <i>Horkelia parryi</i>	m	X		
Carquinez goldenbush <i>Isocoma arguta</i>	m			X
Northern California black walnut (native stands) <i>Juglans californica</i> var. <i>hindsii</i>	r			X
Ahart's dwarf rush <i>Juncus leiospermus</i> var. <i>ahartii</i>	m	X		
Contra Costa goldfields <i>Lasthenia conjugens</i>	m		X	
Delta tule pea <i>Lathyrus jepsonii</i> var. <i>jepsonii</i>	r			X
Pale-yellow layia <i>Layia heterotricha</i>	m			X
Legenere <i>Legenere limosa</i>	m	X		
San Joaquin woollythreads <i>Lembertia congdonii</i>	m			X
Panoche peppergrass <i>Lepidium jaredii</i> ssp. <i>album</i>	m			X

Table 4-10. Continued

Evaluated Species	MSCS Species Goal	No Effect	May Affect	
			Not Likely to Adversely Affect	Likely to Adversely Affect
Plants (continued)				
Heckard's peppergrass <i>Lepidium latipes</i> var. <i>heckardii</i>	m			X
Saw-toothed lewisia <i>Lewisia serrata</i>	m		X	
Mason's lilaeopsis <i>Lilaeopsis masonii</i>	R			X
Pitkin Marsh lily <i>Lilium pardalinum</i> ssp. <i>pitkinense</i>	m	X		
Bellinger's meadowfoam <i>Limnanthes floccosa</i> ssp. <i>bellingeriana</i>	m			X
Butte County meadowfoam <i>Limnanthes floccosa</i> ssp. <i>californica</i>	m	X		
Sebastopol meadowfoam <i>Limnanthes vinculans</i>	m	X		
Delta mudwort <i>Limosella subulata</i>	r			X
Mt. Tedoc linanthus <i>Linanthus nuttallii</i> ssp. <i>howellii</i>	m	X		
Madera linanthus <i>Linanthus serrulatus</i>	m			X
Congdon's lomatium <i>Lomatium congdonii</i>	m			X
Red-flowered lotus <i>Lotus rubriflorus</i>	m			X
Shaggyhair lupine <i>Lupinus spectabilis</i>	m			X
Showy madia <i>Madia radiata</i>	m			X
Hall's bush mallow <i>Malacothamnus hallii</i>	m			X
San Antonio Hills monardella <i>Monardella antonina</i> ssp. <i>antonina</i>	m			X
Few-flowered navarretia <i>Navarretia leucocephala</i> ssp. <i>pauciflora</i>	m	X		

Evaluated Species	MSCS Species Goal	No Effect	May Affect	
			Not Likely to Adversely Affect	Likely to Adversely Affect
Plants (continued)				
Many-flowered navarretia <i>Navarretia leucocephala</i> ssp. <i>plieantha</i>	m	X		
Pincushion navarretia <i>Navarretia myersii</i>	m	X		
Colusa grass <i>Neostapfia colusana</i>	m		X	
Shasta snow-wreath <i>Neviusia cliftonii</i>	m			X
Antioch Dunes evening-primrose <i>Oenothera deltoides</i> ssp. <i>howellii</i>	R			X
Antioch Dunes evening-primrose critical habitat				X
San Joaquin Valley orcutt grass <i>Orcuttia inaequalis</i>	m	X		
Hairy orcutt grass <i>Orcuttia pilosa</i>	m	X		
Slender orcutt grass <i>Orcuttia tenuis</i>	m			X
Sacramento orcutt grass <i>Orcuttia viscida</i>	m	X		
Ahart's paronychia <i>Paronychia ahartii</i>	m			X
Thread-leaved beardtongue <i>Penstemon filiformis</i>	m	X		
White-rayed pentachaeta <i>Pentachaeta bellidiflora</i>	m	X		
Merced phacelia <i>Phacelia ciliata</i> var. <i>opaca</i>	m			X
Mt. Diablo phacelia <i>Phacelia phacelioides</i>	m			X
Calistoga popcornflower <i>Plagiobothrys strictus</i>	m	X		
North Coast semaphore grass <i>Pleuropogon hooverianus</i>	m	X		
Napa blue grass <i>Poa napensis</i>	m	X		
Marin knotweed <i>Polygonum marinense</i>	m		X	

Table 4-10. Continued

Evaluated Species	MSCS Species Goal	No Effect	May Affect	
			Not Likely to Adversely Affect	Likely to Adversely Affect
Plants (continued)				
Eel-grass pondweed <i>Potamogeton zosteriformis</i>	m			X
Hartweg's golden sunburst <i>Pseudobahia bahiifolia</i>	m			X
San Joaquin adobe sunburst <i>Pseudobahia peirsonii</i>	m	X		
California beaked-rush <i>Rhynchospora californica</i>	m	X		
Sanford's arrowhead <i>Sagittaria sanfordii</i>	m			X
Rock sanicle <i>Sanicula saxatilis</i>	m			X
Mad-dog skullcap <i>Scutellaria lateriflora</i>	m	X		
Marsh skullcap <i>Scutellaria galericulata</i>	m			X
Red Hills ragwort <i>Senecio clevelandii</i> var. <i>heterophyllus</i>	m			X
Layne's ragwort <i>Senecio layneae</i>	m	X		
Marin checkerbloom <i>Sidalcea hickmanii</i> ssp. <i>viridis</i>	m	X		
Marsh checkerbloom <i>Sidalcea oregana</i> ssp. <i>hydrophila</i>	m			X
Kenwood Marsh checkerbloom <i>Sidalcea oregana</i> ssp. <i>valida</i>	m	X		
English peak greenbriar <i>Smilax jamesii</i>	m			X
Most beautiful jewel-flower <i>Streptanthus albidus</i> ssp. <i>peramoenus</i>	m			X
Mt. Hamilton jewelflower <i>Streptanthus callistus</i>	m			X
Mt. Diablo jewelflower <i>Streptanthus hispidus</i>	m			X
Arburua Ranch jewelflower <i>Streptanthus insignis</i> ssp. <i>lyonii</i>	m			X
Tiburon jewelflower <i>Streptanthus niger</i>	m	X		

Table 4-10. Continued

Evaluated Species	MSCS Species Goal	No Effect	May Affect	
			Not Likely to Adversely Affect	Likely to Adversely Affect
Plants (continued)				
California seablite <i>Suaeda californica</i>	m	X		
Showy Indian clover <i>Trifolium amoenum</i>	m	X		
Greene's tuctoria <i>Tuctoria greenei</i>	m	X		
Crampton's tuctoria <i>Tuctoria mucronata</i>	r			X
California vervain <i>Verbena californica</i>	m			X

Table 4-11. Summary of Effects of CALFED Actions and Conservation Measures on Evaluated Species

Page 1 of 13

Multi-Species Conservation Strategy (MSCS) User Guide: This table identifies the evaluated species, the MSCS goal for each species, and the likelihood that each species would benefit from implementation of CALFED actions, primarily the Ecosystem Restoration Program actions. A species is identified as likely benefitting from CALFED actions that restore additional species habitat, enhance existing habitat, or increase the number of individuals or species populations. Species identified in this table as not likely to benefit discernibly from CALFED actions have conservation measures in the MSCS designed to fully mitigate adverse impacts and achieve the goal of maintaining the species ("m" goal).

Evaluated Species	MSCS Species Goal	Species Would Most Likely Benefit	No Discernable Species Benefit Likely ¹
Mammals			
California wolverine <i>Gulo gulo luteus</i>	m		X
Giant kangaroo rat <i>Dipodomys ingens</i>	m		X
Greater western mastiff-bat <i>Eupomops perotis californicus</i>	m		X
Merced kangaroo rat <i>Dipodomys heermanni dixonii</i>	m		X
Nelson's antelope ground squirrel <i>Ammospermophilus nelsoni</i>	m		X
Ringtail <i>Bassariscus astutus</i>	m	X	
Riparian brush rabbit <i>Sylvilagus bachmanii riparius</i>	r	X	
Salt marsh harvest mouse <i>Reithrodontomys raviventris</i>	r	X	
San Joaquin kit fox <i>Vulpes macrotis mutica</i>	m		X
San Joaquin Valley woodrat <i>Neotoma fuscipes riparia</i>	r	X	
San Pablo California vole <i>Microtus californicus sanpabloensis</i>	r	X	
Suisun ornate shrew <i>Sorex ornatus sinuosus</i>	R	X	
Birds			
Aleutian Canada goose <i>Branta canadensis leucopareia</i>	m	X	
American peregrine falcon <i>Falco peregrinus anatum</i>	m	X	
Bald eagle <i>Haliaeetus leucocephalus</i>	m	X	
Bank swallow <i>Riparia riparia</i>	r	X	
Black-crowned night heron (rookery) <i>Nycticorax nycticorax</i>	m	X	

Table 4-11. Continued

Evaluated Species	MSCS Species Goal	Species Would Most Likely Benefit	No Discernable Species Benefit Likely ¹
Birds (continued)			
Black tern <i>Chlidonias niger</i>	m	X	
California black rail <i>Laterallus jamaicensis coturniculus</i>	r	X	
California brown pelican <i>Pelecanus occidentalis californicus</i>	m		X
California clapper rail <i>Rallus longirostris obsoletus</i>	r	X	
California condor <i>Gymnogyps californianus</i>	m		X
California gull <i>Larus californicus</i>	m	X	
California least tern <i>Sterna antillarum browni</i>	m		X
California yellow warbler <i>Dendroica petechia brewsteri</i>	r	X	
Cooper's hawk <i>Accipiter cooperi</i>	m	X	
Double-crested cormorant (rookery) <i>Phalarocorax auritus</i>	m	X	
Golden eagle <i>Aquila chrysaetos</i>	m		X
Grasshopper sparrow <i>Ammodramus savannarum</i>	m		X
Great blue heron (rookery) <i>Ardea herodias</i>	m	X	
Great egret (rookery) <i>Casmerodius albus</i>	m	X	
Greater sandhill crane <i>Grus canadensis tabida</i>	r	X	
Least Bell's vireo <i>Vireo bellii pusillus</i>	r	X	
Little willow flycatcher <i>Empidonax traillii brewsteri</i>	r	X	
Long-billed curlew <i>Numenius americanus</i>	m	X	
Long-eared owl <i>Asio otus</i>	m	X	
Mountain plover <i>Charadrius montanu</i>	m		X
Northern harrier <i>Circus cyaneus</i>	m	X	

Table 4-11. Continued

Evaluated Species	MSCS Species Goal	Species Would Most Likely Benefit	No Discernable Species Benefit Likely ¹
Birds (continued)			
Northern spotted owl <i>Strix occidentalis caurina</i>	m		X
Northern spotted owl critical habitat			X
Osprey <i>Pandion haliaetus</i>	m	X	
Saltmarsh common yellowthroat <i>Geothlypis trichas sinuosa</i>	r	X	
San Pablo song sparrow <i>Melospiza melodia samuelis</i>	R	X	
Short-eared owl <i>Asio flammeus</i>	m	X	
Snowy egret (rookery) <i>Egretta thula</i>	m	X	
Suisun song sparrow <i>Melospiza melodia maxillaris</i>	R	X	
Swainson's hawk <i>Buteo swainsoni</i>	r	X	
Tricolored blackbird <i>Agelaius tricolor</i>	m	X	
Western burrowing owl <i>Athene cunicularia hypugea</i>	m		X
Western least bittern <i>Ixobrychus auritus</i>	m	X	
Western snowy plover <i>Charadrius alexandrinus nivosus</i>	m	X	
Western yellow-billed cuckoo <i>Coccyzus americanus occidentalis</i>	r	X	
White-faced ibis <i>Plegadis chihi</i>	m	X	
White-tailed kite <i>Elanus leucurus</i>	m	X	
Yellow-breasted chat <i>Icteria virens</i>	m	X	
Reptiles			
Alameda whipsnake <i>Masticophis lateralis euryxanthus</i>	m		X
Blunt-nosed leopard lizard <i>Gambelia silus</i>	m		X
Giant garter snake <i>Thamnophis gigas</i>	r	X	
San Joaquin whipsnake <i>Masticophis flagellum ruddocki</i>	m		X

Evaluated Species	MSCS Species Goal	Species Would Most Likely Benefit	No Discernable Species Benefit Likely ¹
Reptiles (continued)			
Western pond turtle <i>Clemmys marmorata</i>	m	X	
Amphibians			
California red-legged frog <i>Rana aurora draytoni</i>	m		X
California tiger salamander <i>Ambystoma californiense</i>	m		X
Foothill yellow-legged frog <i>Rana boylei</i>	m		X
Limestone salamander <i>Hydromantes brunus</i>	m		X
Shasta salamander <i>Hydromantes shastae</i>	m		X
Western spadefoot <i>Scaphiopus hammondi</i>	m		X
Fishes			
Central California Coast steelhead evolutionarily significant unit (ESU) <i>Oncorhynchus mykiss</i>	m	X	
Central California Coast steelhead ESU critical habitat		X	
Central Valley fall-/late-fall-run chinook salmon ESU <i>Oncorhynchus tshawytscha</i> (fr)	R	X	
Central Valley spring-run chinook salmon ESU <i>Oncorhynchus tshawytscha</i> (sr)	R	X	
Central Valley spring-run chinook salmon ESU critical habitat	R	X	
Central Valley steelhead ESU <i>Oncorhynchus mykiss</i>	R	X	
Central Valley steelhead ESU critical habitat	R	X	
Delta smelt <i>Hypomesus transpacificus</i>	R	X	
Delta smelt critical habitat		X	
Green sturgeon <i>Acipenser medirostris</i>	R	X	
Hardhead <i>Mylopharodon conocephalus</i>	m		X
Longfin smelt <i>Spirinchus thaleichthys</i>	R	X	
McCloud river redband trout <i>Oncorhynchus mykiss</i> ssp. 2	m		X

Table 4-11. Continued

Evaluated Species	MSCS Species Goal	Species Would Most Likely Benefit	No Discernable Species Benefit Likely ¹
Fishes (continued)			
Rough sculpin <i>Cottus asperimui</i>	m		X
Sacramento perch <i>Archoplites interruptus</i>	r	X	
Sacramento splittail <i>Pogonichthys macrolepidotus</i>	R	X	
Tidewater goby <i>Eucyclogobius newberryi</i>	m		X
Sacramento River winter-run chinook salmon ESU <i>Oncorhynchus tshawytscha</i> (wr)	R	X	
Sacramento River winter-run chinook salmon ESU critical habitat		X	
Invertebrates			
California freshwater shrimp <i>Syncaris pacifica</i>	m		X
Callippe silverspot <i>Speyeria callippe callippe</i>	m		X
Conservancy fairy shrimp <i>Branchinecta conservatio</i>	m		X
Delta green ground beetle <i>Elaphrus viridis</i>	r	X	
Delta green ground beetle critical habitat		X	
Lange's metalmark <i>Apodemis mormo langei</i>	R	X	
Longhorn fairy shrimp <i>Branchinecta longiantenna</i>	m		X
Mid-valley fairy shrimp <i>Branchinecta n. sp. "mid-valley"</i>	m		X
Monarch butterfly (roost) <i>Danaus plexippus</i>	m		X
Shasta sideband <i>Monadenia troglodytes</i>	m		X
Valley elderberry longhorn beetle <i>Desmocerus californicus dimorphus</i>	R	X	
Valley elderberry longhorn beetle critical habitat		X	
Vernal pool fairy shrimp <i>Branchinecta lynchi</i>	m		X
Vernal pool tadpole shrimp <i>Lepidurus packardii</i>	m		X

Evaluated Species	MSCS Species Goal	Species Would Most Likely Benefit	No Discernable Species Benefit Likely ¹
Plants			
Henderson's bent grass <i>Agrostis hendersonii</i>	m		X
Sharsmith's onion <i>Allium sharsmithae</i>	m		X
Rawhide Hill onion <i>Allium tuolumnense</i>	m		X
Sonoma alopecurus <i>Alopecurus aequalis</i> var. <i>sonomensis</i>	m		X
Large-flowered fiddleneck <i>Amsinckia grandiflora</i>	m		X
Large-flowered fiddleneck critical habitat			X
Dimorphic snapdragon <i>Antirrhinum subcordatum</i>	m		X
Mt. Diablo manzanita <i>Arctostaphylos auriculata</i>	m		X
Baker's manzanita <i>Arctostaphylos bakeri</i> ssp. <i>bakeri</i>	m		X
Klamath manzanita <i>Arctostaphylos klamathensis</i>	m		X
Contra Costa manzanita <i>Arctostaphylos manzanita</i> ssp. <i>laevigata</i>	m		X
Ione manzanita <i>Arctostaphylos myrtifolia</i>	m		X
Pallid manzanita <i>Arctostaphylos pallida</i>	m		X
Suisun Marsh aster <i>Aster lentus</i>	R	X	
Clara Hunt's milk-vetch <i>Astragalus clarianus</i>	m		X
Big Bear Valley woollypod <i>Astragalus leucolobus</i>	m		X
Jepson's milk-vetch <i>Astragalus rattanii</i> var. <i>jepsonianus</i>	m		X
Ferris's milk-vetch <i>Astragalus tener</i> var. <i>ferrisiae</i>	m		X
Alkali milk-vetch <i>Astragalus tener</i> var. <i>tener</i>	r	X	
Heartscale <i>Atriplex cordulata</i>	m		X
Brittlescale <i>Atriplex depressa</i>	m		X

Table 4-11. Continued

Evaluated Species	MSCS Species Goal	Species Would Most Likely Benefit	No Discernable Species Benefit Likely ¹
Plants (continued)			
San Joaquin spearscale <i>Atriplex joaquiniana</i>	m		X
Lesser saltscale <i>Atriplex minuscula</i>	m		X
Vernal pool smallscale <i>Atriplex persistens</i>	m		X
Lost Hills crownscale <i>Atriplex vallicola</i>	m		X
Sonoma sunshine <i>Blennosperma bakeri</i>	m		X
Big tarplant <i>Blepharizonia plumosa</i> ssp. <i>plumosa</i>	m		X
Indian Valley brodiaea <i>Brodiaea coronaria</i> ssp. <i>rosea</i>	m		X
Chinese Camp brodiaea <i>Brodiaea pallida</i>	m		X
Mt. Diablo fairy-lantern <i>Calochortus pulchellus</i>	m		X
Tiburon Mariposa lily <i>Calochortus tiburonensis</i>	m		X
Stebbins' morning-glory <i>Calystegia stebbinsii</i>	m		X
San Benito evening-primrose <i>Camissonia benitensis</i>	m		X
Sharsmith's harebell <i>Campanula sharsmithiae</i>	m		X
White sedge <i>Carex albida</i>	m		X
Bristly sedge <i>Carex comosa</i>	r	X	
Tree-anemone <i>Carpenteria californica</i>	m		X
Tiburon Indian paintbrush <i>Castilleja affinis</i> ssp. <i>neglecta</i>	m		X
Succulent owl's-clover <i>Castilleja campestris</i> ssp. <i>succulenta</i>	m		X
Mason's ceanothus <i>Ceanothus masonii</i>	m		X
Pine Hill ceanothus <i>Ceanothus roderickii</i>	m		X
Hoover's spurge <i>Chamaesyce hooveri</i>	m		X

Evaluated Species	MSCS Species Goal	Species Would Most Likely Benefit	No Discernable Species Benefit Likely ¹
Plants (continued)			
Dwarf soaproot <i>Chlorogalum pomeridianum</i> var. <i>minus</i>	m		X
Sonoma spineflower <i>Chorizanthe valida</i>	m		X
Slough thistle <i>Cirsium crassicaule</i>	m	X	
Suisun thistle <i>Cirsium hydrophilum</i> var. <i>hydrophilum</i>	R	X	
Mariposa clarkia <i>Clarkia biloba</i> ssp. <i>australis</i>	m		X
Shasta clarkia <i>Clarkia borealis</i> ssp. <i>arida</i>	m		X
Beaked clarkia <i>Clarkia rostrata</i>	m		X
Point Reyes bird's-beak <i>Cordylanthus maritimus</i> ssp. <i>palustris</i>	r	X	
Hispid bird's-beak <i>Cordylanthus mollis</i> ssp. <i>hispidus</i>	m	X	
Soft bird's-beak <i>Cordylanthus mollis</i> ssp. <i>mollis</i>	R	X	
Mt. Diablo bird's-beak <i>Cordylanthus nidularius</i>	m		X
Palmate-bracted bird's-beak <i>Cordylanthus palmatus</i>	m		X
Mt. Hamilton coreopsis <i>Coreopsis hamiltonii</i>	m		X
Silky cryptantha <i>Cryptantha crinita</i>	m	X	
Baker's larkspur <i>Delphinium bakeri</i>	m		X
Hospital Canyon larkspur <i>Delphinium californicum</i> ssp. <i>interius</i>	m		X
Yellow larkspur <i>Delphinium luteum</i>	m		X
Recurved larkspur <i>Delphinium recurvatum</i>	m		X
Four-angled spikerush <i>Eleocharis quadrangulata</i>	m		X
Brandegee's eriastrum <i>Eriastrum brandegeae</i>	m		X
Hoover's eriastrum <i>Eriastrum hooveri</i>	m		X

Table 4-11. Continued

Evaluated Species	MSCS Species Goal	Species Would Most Likely Benefit	No Discernable Species Benefit Likely ¹
Plants (continued)			
Ione buckwheat <i>Eriogonum apricum</i> var. <i>apricum</i>	m		X
Irish Hill buckwheat <i>Eriogonum apricum</i> var. <i>prostratum</i>	m		X
Ben Lomond buckwheat <i>Eriogonum nudum</i> var. <i>decurrens</i>	m		X
Loch Lomond button-celery <i>Eryngium constancei</i>	m		X
Delta coyote-thistle <i>Eryngium racemosum</i>	r	X	
Spiny-sepaled button-celery <i>Eryngium spinosepalum</i>	m		X
Contra Costa wallflower <i>Erysimum capitatum</i> ssp. <i>angustatum</i>	R	X	
Contra Costa wallflower critical habitat		X	
Diamond-petaled California poppy <i>Eschscholzia rhombipetala</i>	m		X
Pine Hill flannelbush <i>Fremontodendron decumbens</i>	m		X
Adobe-lily <i>Fritillaria pluriflora</i>	m		X
El Dorado bedstraw <i>Galium californicum</i> ssp. <i>sierrae</i>	m		X
Boggs Lake hedge-hyssop <i>Gratiola heterosepala</i>	m		X
Diablo helianthella <i>Helianthella castanea</i>	m		X
Hall's tarplant <i>Hemizonia halliana</i>	m		X
Congdon's tarplant <i>Hemizonia parryi</i> ssp. <i>congonii</i>	m		X
Brewer's western flax <i>Hesperolinon breweri</i>	m		X
Marin western flax <i>Hesperolinon congestum</i>	m		X
Drymaria-like western flax <i>Hesperolinon drymarioides</i>	m		X
Napa western flax <i>Hesperolinon serpentinum</i>	m		X
Tehama County western flax <i>Hesperolinon tehamense</i>	m		X

Table 4-11. Continued

Evaluated Species	MSCS Species Goal	Species Would Most Likely Benefit	No Discernable Species Benefit Likely ¹
Plants (continued)			
Rose-mallow <i>Hibiscus lasiocarpus</i>	m	X	
Santa Cruz tarplant <i>Holocarpha macradenia</i>	m		X
Parry's horkelia <i>Horkelia parryi</i>	m		X
Carquinez goldenbush <i>Isocoma arguta</i>	m	X	
Northern California black walnut (native stands) <i>Juglans californica</i> var. <i>hindsii</i>	r	X	
Ahart's dwarf rush <i>Juncus leiospermus</i> var. <i>ahartii</i>	m		X
Contra Costa goldfields <i>Lasthenia conjugens</i>	m	X	
Delta tule pea <i>Lathyrus jepsonii</i> var. <i>jepsonii</i>	r	X	
Pale-yellow layia <i>Layia heterotricha</i>	m		X
Legenere <i>Legenere limosa</i>	m		X
San Joaquin woollythreads <i>Lembertia congdonii</i>	m		X
Panoche peppergrass <i>Lepidium jaredii</i> ssp. <i>album</i>	m		X
Heckard's peppergrass <i>Lepidium latipes</i> var. <i>heckardii</i>	m	X	
Saw-toothed lewisia <i>Lewisia serrata</i>	m		X
Mason's lilaeopsis <i>Lilaeopsis masonii</i>	R	X	
Pitkin Marsh lily <i>Lilium pardalinum</i> ssp. <i>pitkinense</i>	m		X
Bellinger's meadowfoam <i>Limnanthes floccosa</i> ssp. <i>bellingermana</i>	m		X
Butte County meadowfoam <i>Limnanthes floccosa</i> ssp. <i>californica</i>	m		X
Sebastopol meadowfoam <i>Limnanthes vinculans</i>	m		X
Delta mudwort <i>Limosella subulata</i>	r	X	
Mt. Tedoc linanthus <i>Linanthus nuttallii</i> ssp. <i>howellii</i>	m		X

Table 4-11. Continued

Evaluated Species	MSCS Species Goal	Species Would Most Likely Benefit	No Discernable Species Benefit Likely ¹
Plants (continued)			
Madera linanthus <i>Linanthus serrulatus</i>	m		X
Congdon's lomatium <i>Lomatium congdonii</i>	m		X
Red-flowered lotus <i>Lotus rubriflorus</i>	m		X
Shaggyhair lupine <i>Lupinus spectabilis</i>	m		X
Showy madia <i>Madia radiata</i>	m		X
Hall's bush mallow <i>Malacothamnus hallii</i>	m		X
San Antonio Hills monardella <i>Monardella antonina</i> ssp. <i>antonina</i>	m		X
Few-flowered navarretia <i>Navarretia leucocephala</i> ssp. <i>pauciflora</i>	m		X
Many-flowered navarretia <i>Navarretia leucocephala</i> ssp. <i>plieantha</i>	m		X
Pincushion navarretia <i>Navarretia myersii</i>	m		X
Colusa grass <i>Neostapfia colusana</i>	m	X	
Shasta snow-wreath <i>Neviusia cliftonii</i>	m		X
Antioch Dunes evening-primrose <i>Oenothera deltooides</i> ssp. <i>howellii</i>	R	X	
Antioch Dunes evening-primrose critical habitat		X	
San Joaquin Valley orcutt grass <i>Orcuttia inaequalis</i>	m		X
Hairy orcutt grass <i>Orcuttia pilosa</i>	m		X
Slender orcutt grass <i>Orcuttia tenuis</i>	m		X
Sacramento orcutt grass <i>Orcuttia viscida</i>	m		X
Ahart's paronychia <i>Paronychia ahartii</i>	m		X
Thread-leaved beardtongue <i>Penstemon filiformis</i>	m		X
White-rayed pentachaeta <i>Pentachaeta bellidiflora</i>	m		X

Evaluated Species	MSCS Species Goal	Species Would Most Likely Benefit	No Discernable Species Benefit Likely ¹
Plants (continued)			
Merced phacelia <i>Phacelia ciliata</i> var. <i>opaca</i>	m		X
Mt. Diablo phacelia <i>Phacelia phacelioides</i>	m		X
Calistoga popcornflower <i>Plagiobothrys strictus</i>	m		X
North Coast semaphore grass <i>Pleuropogon hooverianus</i>	m		X
Napa blue grass <i>Poa napensis</i>	m		X
Marin knotweed <i>Polygonum marinense</i>	m	X	
Eel-grass pondweed <i>Potamogeton zosteriformis</i>	m	X	
Hartweg's golden sunburst <i>Pseudobahia bahiifolia</i>	m		X
San Joaquin adobe sunburst <i>Pseudobahia peirsonii</i>	m		X
California beaked-rush <i>Rhynchospora californica</i>	m		X
Sanford's arrowhead <i>Sagittaria sanfordii</i>	m	X	
Rock sanicle <i>Sanicula saxatilis</i>	m		X
Mad-dog skullcap <i>Scutellaria lateriflora</i>	m		X
Marsh skullcap <i>Scutellaria galericulata</i>	m		X
Red Hills ragwort <i>Senecio clelandii</i> var. <i>heterophyllus</i>	m		X
Layne's ragwort <i>Senecio layneae</i>	m		X
Marin checkerbloom <i>Sidalcea hickmanii</i> ssp. <i>viridis</i>	m		X
Marsh checkerbloom <i>Sidalcea oregana</i> ssp. <i>hydrophila</i>	m		X
Kenwood Marsh checkerbloom <i>Sidalcea oregana</i> ssp. <i>valida</i>	m		X
English peak greenbriar <i>Smilax jamesii</i>	m		X
Most beautiful jewel-flower <i>Streptanthus albidus</i> ssp. <i>peramoenus</i>	m		X

Evaluated Species	MSCS Species Goal	Species Would Most Likely Benefit	No Discernable Species Benefit Likely ¹
Plants (continued)			
Mt. Hamilton jewelflower <i>Streptanthus callistus</i>	m		X
Mt. Diablo jewelflower <i>Streptanthus hispidus</i>	m		X
Arburua Ranch jewelflower <i>Streptanthus insignis</i> ssp. <i>lyonii</i>	m		X
Tiburon jewelflower <i>Streptanthus niger</i>	m		X
California seablite <i>Suaeda californica</i>	m		X
Showy Indian clover <i>Trifolium amoenum</i>	m		X
Greene's tuctoria <i>Tuctoria greenei</i>	m		X
Crampton's tuctoria <i>Tuctoria mucronata</i>	r	X	
California vervain <i>Verbena californica</i>	m		X

Note:

¹ These species are not expected to benefit substantially from CALFED actions; however, the MSCS includes conservation measures for these species that address potential adverse effects of all CALFED actions and achieve the goal of maintaining the species.

Table 4-12. Summary Effect of Implementing CALFED Actions with Conservation Measures on Evaluated Species with “R” and “r” Goals

Multi-Species Conservation Strategy (MSCS) User Guide: This table presents the expected summary effect of implementing all CALFED actions and MSCS conservation measures for evaluated species with a “R” or “r” goal. These findings assume that all CALFED actions will be implemented, including the conservation measures presented in the MSCS, that implementation of CALFED actions will be sequenced to minimize impacts on these species, and that CALFED’s water management component will ultimately be structured in a way that promotes recovery of fish species.

Evaluated Species	Summary Effect of Implementing CALFED Actions with Conservation Measures
“R” Goal Species	
Delta smelt (<i>Hypomesus transpacificus</i>)	Restoration and maintenance of Delta smelt populations to levels that ensure the species’ long-term viability and enhancement of its federal Endangered Species Act (FESA) designated critical habitat.
Longfin smelt (<i>Spirinchus thaleichthys</i>)	Restoration and maintenance of longfin smelt populations to levels that ensure the species’ long-term viability.
Green sturgeon (<i>Acipenser medirostris</i>)	Restoration and maintenance of Central Valley green sturgeon populations to levels that ensure the species’ long-term viability.
Sacramento River winter-run chinook salmon evolutionarily significant unit (ESU) (<i>Oncorhynchus tshawytscha</i> [wr])	Restoration and maintenance of Sacramento River winter-run chinook salmon ESU populations to levels that ensure the species’ long-term viability and enhancement of its FESA designated critical habitat.
Central Valley fall-/late-fall-run chinook salmon ESU (<i>Oncorhynchus tshawytscha</i> [fr])	Restoration and maintenance of all runs of Central Valley fall-/late-fall-run chinook salmon ESU populations to levels that ensure the long-term viability of individual runs and of the species.
Central Valley spring-run chinook salmon ESU (<i>Oncorhynchus tshawytscha</i> [sr])	Restoration and maintenance of Central Valley spring-run chinook salmon ESU populations in the Sacramento River watershed to levels that ensure the long-term viability of the species and enhancement of its FESA designated critical habitat.
Central Valley steelhead ESU (<i>Oncorhynchus mykiss</i> [cv])	Restoration and maintenance of Central Valley steelhead ESU populations to levels that ensure the species’ long-term viability and enhancement of its FESA designated critical habitat.
Sacramento splittail (<i>Pogonichthys macrolepidotus</i>)	Restoration and maintenance of Sacramento splittail populations to levels that ensure the species’ long-term viability.
San Pablo song sparrow (<i>Melospiza melodia samuelis</i>)	Increased numbers of and restoration, maintenance, and expanded distribution of San Pablo song sparrow populations within its historic range to levels that ensure the long-term viability of the species.
Suisun ornate shrew (<i>Sorex ornatus sinuosus</i>)	Increased numbers of and restoration, maintenance, and expanded distribution of Suisun ornate shrew populations within its historic range to levels that ensure the long-term viability of the species.
Suisun song sparrow (<i>Melospiza melodia maxillaris</i>)	Increased numbers of and restoration, maintenance, and expanded distribution of Suisun song sparrow populations within its historic range to levels that ensure the long-term viability of the species.

Table 4-12. Continued

Evaluated Species	Summary Effect of Implementing CALFED Actions with Conservation Measures
“R” Goal Species (continued)	
Valley elderberry longhorn beetle (<i>Desmocerus californicus dimorphus</i>)	Restoration, maintenance, and expanded distribution of valley elderberry longhorn beetle populations within their historic range to levels that ensure the species’ long-term viability and enhancement of its FESA designated critical habitat.
Lange’s metalmark butterfly (<i>Apodemia mormo langei</i>)	Increased numbers, local expansion, and long-term protection of the Antioch Dunes population of the Lange’s metalmark butterfly.
Soft bird’s-beak (<i>Cordylanthus mollis</i> ssp. <i>mollis</i>)	Restoration, maintenance, and expanded distribution of soft bird’s-beak populations within its historic range to levels that ensure the species’ long-term viability.
Suisun thistle (<i>Cirsium hydropilum</i> var. <i>hydropilum</i>)	Establishment of 10 additional Suisun thistle populations within the species’ historic range and increase the current population by 1,000%.
Antioch Dunes evening-primrose (<i>Oenothera deltoides</i> ssp. <i>howellii</i>)	Increased numbers, local expansion, and long-term protection of the Antioch Dunes population of the Antioch Dunes evening-primrose and enhancement of its FESA designated critical habitat.
Contra Costa wallflower (<i>Erysimum capitatum</i> ssp. <i>angustatum</i>)	Increased numbers, local expansion, and long-term protection of the Antioch Dunes population of the Contra Costa wallflower and enhancement of its FESA designated critical habitat.
Mason’s lilaeopsis (<i>Lilaeopsis masonii</i>)	Substantial increase in numbers and distribution of Mason’s lilaeopsis within its historic range.
Suisun Marsh aster (<i>Aster lentus</i>)	Substantial increase in numbers and distribution of Suisun Marsh aster within its historic range.
“r” Goal Species	
Salt marsh harvest mouse (<i>Reithrodontomys raviventris</i>)	Increased numbers of and restoration, maintenance, and expanded distribution of the salt marsh harvest mouse within the portion of its historic range within the Focus Area.
San Pablo California vole (<i>Microtus californicus sanpabloensis</i>)	Increased numbers of and restoration, maintenance, and expanded distribution of the San Pablo California vole within the portion of its historic range within the Focus Area.
Riparian brush rabbit (<i>Sylvilagus bachmani riparius</i>)	Long-term protection of the existing riparian brush rabbit population at Caswell State Park from threats that could result in its extirpation, and the establishment of up to four additional and self-sustaining populations within the species’ suspected historic range.
San Joaquin Valley woodrat (<i>Neotoma fuscipes riparia</i>)	Long-term protection of the existing San Joaquin Valley woodrat population at Caswell State Park from threats that could result in its extirpation, and increased numbers and expanded distribution of the species within its historic range.

Evaluated Species	Summary Effect of Implementing CALFED Actions with Conservation Measures
"r" Goal Species (continued)	
Bank swallow (<i>Riparia riparia</i>)	Long-term protection of the existing bank swallow nesting substrates, and restoration of ecological processes that create nesting habitat to levels that will allow the species' population and distribution to expand naturally within its historic range.
California yellow warbler (<i>Dendroica petechia brewsteri</i>)	Substantial increase in suitable migration habitat of and potential for the natural expansion of nesting for California yellow warbler populations into formerly occupied nesting areas in the Central Valley.
Little willow flycatcher (<i>Empidonax traillii brewsteri</i>)	Substantial increase in suitable migration habitat of and potential for the natural expansion of nesting for little willow flycatcher populations into formerly occupied nesting areas in the Central Valley.
California clapper rail (<i>Rallus longirostris obsoletus</i>)	Increased numbers of and restoration, maintenance, and expanded distribution of the California clapper rail within the portion of its historic range within the Focus Area.
California black rail (<i>Laterallus jamaicensis coturniculus</i>)	Increased numbers of and restoration, maintenance, and expanded distribution of the California black rail within its historic range in the Bay and Delta Regions.
Greater sandhill crane (<i>Grus canadensis tabida</i>)	Long-term protection of traditional greater sandhill crane wintering areas, and increases in suitable wintering habitat sufficient to support potential future increases in the wintering population.
Least Bell's vireo (<i>Vireo bellii pusillus</i>)	Substantially increase in suitable breeding habitat within the historic nesting range of the least Bell's vireo; and the potential for reestablishment of breeding populations in the San Joaquin Valley.
Saltmarsh common yellowthroat (<i>Geothlypis trichas sinuosa</i>)	Increased numbers of and restoration, maintenance, and expanded distribution of the saltmarsh common yellowthroat in the portion of its historic range within the Focus Area.
Swainson's hawk (<i>Buteo swainsoni</i>)	Restoration and maintenance of Swainson's hawk populations in the Central Valley to levels that ensure the species' long-term viability.
Western yellow-billed cuckoo (<i>Coccyzus americanus occidentalis</i>)	Substantial increase in suitable western yellow-billed cuckoo breeding habitat within the species' historic and current breeding range, and increase the population's potential for natural expansion within the Central Valley.
Sacramento perch (<i>Archoplites interruptus</i>)	Establishment and long-term protection of several new Sacramento perch populations within suitable existing or restored habitat areas within its historic range.
Giant garter snake (<i>Thamnophis gigas</i>)	Long-term protection of existing giant garter snake populations, and potential natural expansion of their Central Valley populations into enhanced and restored suitable habitats.

Evaluated Species	Summary Effect of Implementing CALFED Actions with Conservation Measures
"r" Goal Species (continued)	
Delta green ground beetle (<i>Elaphrus viridis</i>)	Long-term protection of existing Delta green ground beetle populations; establish and maintain 3 additional populations within the species' historic range and enhancement of its FESA designated critical habitat.
Northern California black walnut (<i>Juglans californica</i> var. <i>hindsii</i>) (native stands)	Long-term protection of existing native Northern California black walnut stands, and establishment and long-term maintenance of up to 10 additional stands within the species' historic range.
Bristly sedge (<i>Carex comosa</i>)	Potential for the natural expansion or artificial reestablishment of additional bristly sedge populations within its historic range.
Point Reyes bird's-beak (<i>Cordylanthus maritimus</i> ssp. <i>palustris</i>)	Substantial increases in suitable Point Reyes bird's-beak habitat within the Bay Region, and potential for the natural expansion of the species within existing and enhanced or restored habitat areas.
Crampton's tuctoria (<i>Tuctoria mucronata</i>)	Long-term protection of existing Crampton's tuctoria populations, and the potential for the natural or artificial expansion of populations in suitable enhanced or restored habitat areas.
Delta mudwort (<i>Limosella subulata</i>)	Long-term protection of existing occupied Delta mudwort habitat, and potential for the natural expansion of populations in enhanced and restored habitat areas within its historic range.
Delta tule pea (<i>Lathyrus jepsonii</i> var. <i>jepsonii</i>)	Long-term protection of existing occupied Delta tule pea habitat, and potential for the natural expansion of populations in enhanced and restored habitat areas within its historic range.
Delta coyote-thistle (<i>Eryngium racemosum</i>)	Long-term protection of at least 50% of existing populations and substantial increase in numbers and distribution of the Delta coyote-thistle within its historic range.
Alkali milkvetch (<i>Astragalus tener</i> var. <i>tener</i>)	Long-term protection of existing occupied alkali milkvetch populations, and the establishment and maintenance of additional populations in historic occupied habitat areas.